

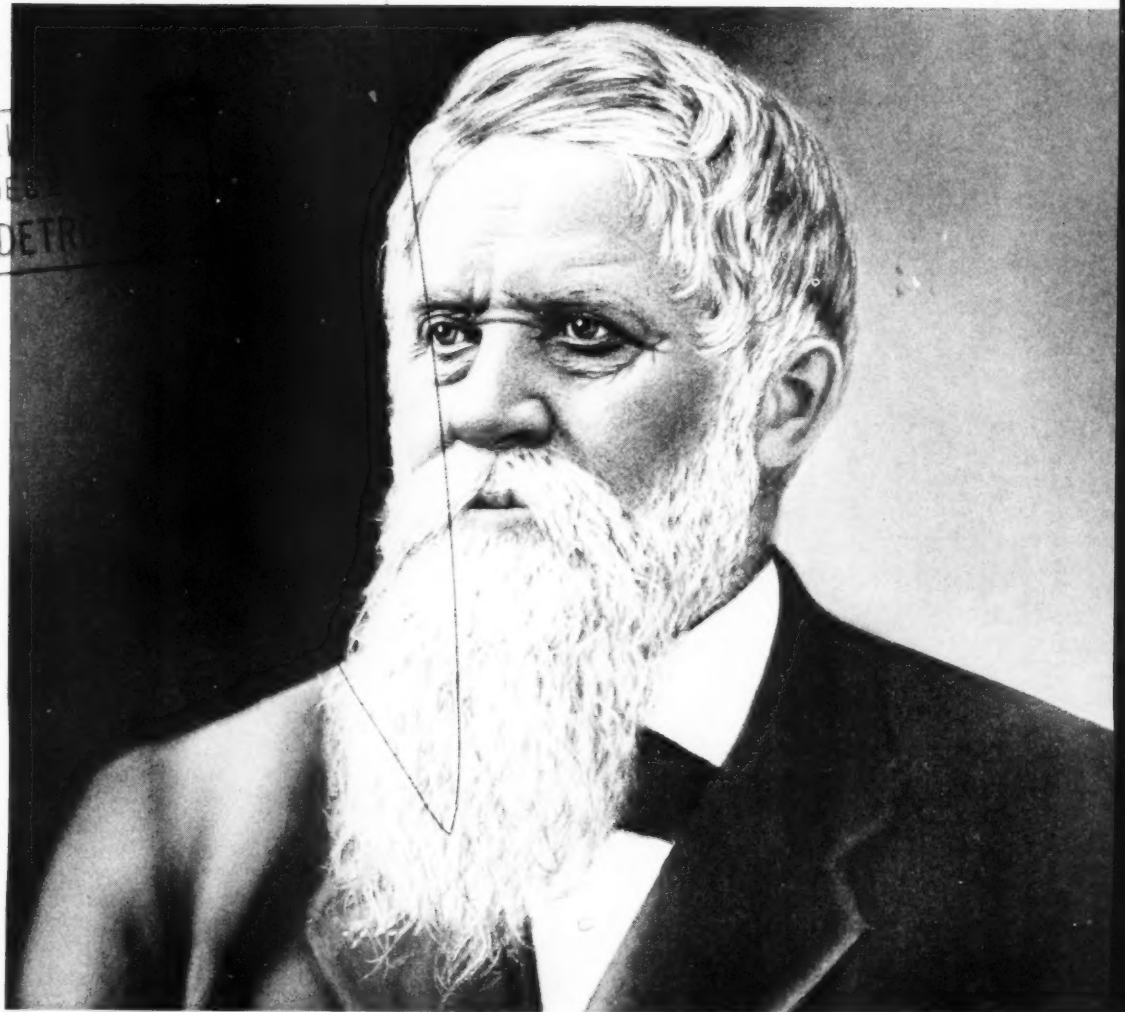
TECHNOLOGY DEPARTMENT

WESTERN
SOCIETY
OF ENGINEERS'

90TH
YEAR

Midwest Engineer

SERVING THE ENGINEERING PROFESSION



DIVERSION OF WATER — PAGE FIVE

Vol. 12

DECEMBER, 1959

No. 5



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COVER STORY

Ninety years ago, in 1869, Chicago elected a new mayor. That same year, Mayor Roswell B. Mason helped launch the important and influential organization, the Western Society of Engineers. The first organizational meeting was held in Mayor Mason's office. Three weeks later eleven of his friends and he founded the present Western Society as the "Civil Engineers Club of the Northwest." Mason was the first president. Now, as the celebration of the Society's 90th Anniversary comes to an end, it seems fitting that the picture of Mayor Mason, Engineer, should favor our cover.

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Harold R. Heckendorn, WSE program chairman, 1959-60.



Frank W. Jenks, president of the International Harvester Company, studies the Citation Award, just received by him.

Harold B. Gotaas, dean of Northwestern University's Technological Institute, starts his presentation.



The panel, on stage in the seventh-floor auditorium, consisting of F. T. Ashman, Ira J. Bach, L. M. Traiser, A. L. Tholin, and L. J. Sorenson.



Ben A. Zimmer (right) pauses over coffee. He spoke on tests relative to building material fire resistance.

CITATION AWARD AFTER-DINNER TALK TECHNICAL SESSIONS

FEATURES OF THE

WSE MEETING OF OCTOBER 27

As with all good things, the social hour came to an end. But as often happens, however, another good thing immediately took its place—dinner in the WSE Dining Room.

Later, over refilled coffee cups, Harold R. Heckendorn, Program Chairman, called the dinner meeting to order. After introducing the persons sitting at the speaker's table, he turned the meeting over to WSE President John T. Rettaliata, president of the Illinois Institute of Technology.

Dr. Rettaliata introduced the recipient of the Western Society's Citation Award, the president of International Harvester Company, with the following words:

"It is a distinct pleasure for me to participate in this event this evening honoring Frank W. Jenks. Mr. Jenks is a man I know and admire very much.

"I think that he is a good example, as far as his career is concerned, of how ability pays off. In fact, I'd like to use him as an example for some of our young graduates who are always in the argument of whether they should go to a small company and be a big wheel, or, as many of them put it, 'get absorbed into a large company and never be recognized'."

Dr. Rettaliata continued with his introduction of Mr. Jenks, concluding by saying to him: "It gives me extreme pleasure to present to you this Certificate recognizing your many accomplishments. It says here that you are a statesman and civic leader, which is really an understatement. If we listed here all of your accomplishments, we would need a much larger space. Congratulations."

Mr. Jenks' Response

Mr. Jenks responded as follows:

"Thank you, Dr. Rettaliata, and thank

all of you, gentlemen of the Western Society of Engineers.

"The very first thing I want to do tonight is to offer my own congratulations and those of International Harvester Company to your Society on the successful completion of the first 90 years of your distinguished professional service.

"I am sure you feel, as I feel, that the next 90 years will bring even more accomplishment, even more recognition, to the engineering profession and to the societies, like this one, which do so much to make technological progress rapid and uniform.

"The honor you have paid to my Company tonight is deeply appreciated by all of us, and I am particularly conscious that it is an honor to the Company and not to any individual—certainly not to me. I am, as you know, a layman in engineering matters, and so my appearance here is only as the representative of the Harvester engineers to whom your tribute is really directed.

"As you would expect, the Harvester engineers are a sizable group of men. At the most recent count, they numbered 1,653 professional engineers. Of these, 1,162 are engaged directly in work for our various engineering departments, while 491 are active in other capacities.

"The task of these Harvester engineers is a large one, for they must design and constantly improve a total of about 1,165 major products in the motor truck, farm equipment, and construction equipment fields, as well as do much of the work in connection with our list of 236,000 service parts.

"To make this easier, we have given them, at our different engineering locations, a total of about 1,192,000 square

feet of our most modern and efficient floor space. This, of course, does not include the outdoor activities, such as proving grounds.

"We all know and recognize that engineering has made remarkable progress in this century. Our own figures give one measurement of the rapidity of that progress. Back in 1910, according to our reports for that year, the Harvester Company spent a grand total of \$576,000 for research, development, and patents.

"Ten years ago, in 1949, we spent a total of about \$14 million for engineering of all our regular products, excluding defense work.

"Last year, in 1958, our expenditures for this purpose were about \$36 million, and they will be approximately the same for 1959. So the increased emphasis is obvious.

"This is natural for, like any capital goods company, our Company is and always has been an engineering institution. From the development of the reaper, 128 years ago, right down to the present day, our progress and indeed our survival have always depended on our ability to design products that are needed, that will work, that will keep on working, and will, we hope, be ahead of competitors.

"That has always been true. The only change is that in today's fast-moving industrial world it is even more true than before.

"So we have a stake, and a vital stake, in engineering progress.

"Let me thank you again for this recognition tonight, and offer to the Western Society of Engineers our very best wishes for continued rapid progress. I know that your Society and your profession face the future with well-justified confidence."

Dean Gotaas Introduced

Mr. Heckendorn again took the floor to introduce Harold B. Gotaas, Dean of Northwestern University's Technological Institute. Dean Gotaas, the dinner speaker, addressed himself on the subject of "Engineering Education for the Future."

The dinner meeting was then adjourned to the two simultaneous technical sessions.

Technical Sessions

Technical Session Number 1 consisted of a panel discussion dealing with the separation of pedestrian movement from vehicular traffic in downtown Chicago. The members of the panel considered

how it should be accomplished and to what degree. They also expressed various viewpoints and offered varying solutions relating to elevated walkways, subsurface walkways, and pedestrian malls.

Session 1 was under the sponsorship of the Hydraulic, Sanitary and Municipal Engineering Section under the chairmanship of Donald F. Reinert. The panel consisted of the moderator: Ira J. Bach, commissioner, Department of City Planning; and the panel members: Frederick T. Aschman, planning consultant; Leslie J. Sorenson, deputy commissioner of Streets and Sanitation for Traffic; Albert L. Tholin, administrative engineer of Public Works; and L. M. Traiser, staff

engineer, Chicago Transit Authority.

Technical Session Number 2 featured Ben A. Zimmer, civil engineer with the Underwriter Laboratories. He spoke on "Tests Relative to Fire Resistance of Building Materials," and dealt with the development of fire resistant materials from the time of Thomas Edison down to the present use of pre-stressed concrete forms. As an adjunct to Mr. Zimmer's talk, a color sound film dealing with the actual testing methods employed by Underwriters Laboratories, was shown.

Session 2 was under the sponsorship of the Fire Protection and Safety Engineering Section, under the chairmanship of Cecil O. Bernard.

Mont Blanc Tunnel Soon To Be Reality?

Prospect of building a tunnel under the English Channel between England and France is "no myth but perhaps a reality in our lifetime," a speaker told a convention session of the American Society of Civil Engineers in Washington, D.C. on Oct. 19.

Another good prospect is the realization of the dream for building a tunnel through Mont Blanc, between France and Italy, Robert O. Swain, executive director of the International Road Federation, of Washington, D.C., told the engineers.

Reporting on the status of foreign highway improvements, Mr. Swain said that the general status of such improvements is "amazing."

"Amazing I believe to be an appropriate term if we consider the progress that has been made in the fields of highway development and highway transportation on a worldwide basis since the end of World War II," Mr. Swain stated.

"It is amazing when we recognize that today the proportionate increase in road expenditures in foreign countries actually exceeds that of the United States. This is so despite our spectacular interstate building program."

While highway expenditures increased about 38 per cent in the United States from 1955 to 1958, he said, the free world countries, not counting the United States, showed a 95 per cent increase in such expenditures for the same period. More than half of the money spent by the other free countries was spent in the United States.

In 1958, he said, the highway expenditures in the free world countries totaled \$17.13 billion, of which \$9.93 billion was spent in the United States.

Highway improvements in countries behind the Iron Curtain were not included in Mr. Swain's report. But it covered most other nations where, he said, there has been a growing consciousness that serviceable road networks are basic to economic and social development.

Regarding highway improvement in Europe, he said there are several matters which are indicative of the amazing progress in highway development in that area.

"For example," he noted, "the International Road Federation is cooperating with a group that is studying the feasibility

and desirability of a tunnel under the English Channel. This is no myth but perhaps a reality in our lifetime.

"Another group in Europe is accomplishing a long-cherished dream of building a tunnel through Mont Blanc. This \$30 million project will allow all-weather traffic and reduce the existing 97.5-mile trip between France and Italy to about eight miles."

He expressed the opinion that the progress in the planning and construction of improved land routes which thread the globe is a "heartening one."

"This is not to say that all problems are solved or that the necessity for continued technical education, financial assistance, research and allied aids on the part of the United States is diminishing."

Maxson To Serve As Chairman

R. D. Maxson, Western Society first vice-president, has been appointed chairman of one of the sessions of the Engineering and Scientific Manpower Conference being held in Chicago on Dec. 28. The conference is part of the Annual Meeting Program of the American Association for the Advancement of Science.

The Manpower Conference is jointly sponsored by the Engineering and Scientific Manpower commissions, the National Science Foundation, and the National Academy of Sciences—National Research Council with the local cooperation of the Western Society of Engineers. WSE is acting as host, and the Society's members are invited to attend.

The Conference is under the broad theme of "Higher Education and Training in Emerging Fields of Technology." It will consist of two sessions with several major presentations in each.

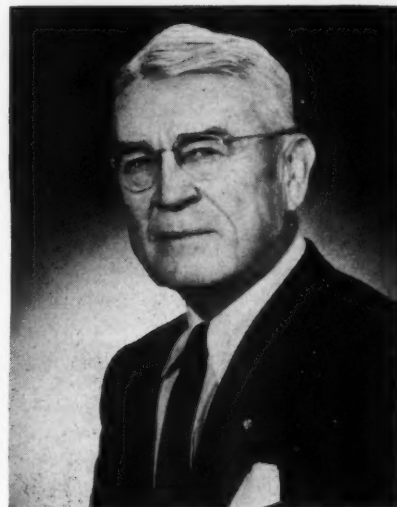
First Postmen

In the 18th Century, England found a profitable way to cure the problems of delinquency, reports *Product Engineering*. When the first mail service began in London, vandals emptied mail carriages and stuffed mail boxes with paper. To solve the problem, the delinquents were hired — and became the world's first postmen.

DIVERSION OF WATER

By Horace P. Ramey

This is a condensation of the talk presented by Mr. Ramey before a West Suburban meeting of the Western Society of Engineers on Oct. 14, 1959. A member of the Western Society, Mr. Ramey is consulting engineer and former chief engineer of the Chicago Metropolitan Sanitary District.



Examples of the diversion of water from one watershed into another are cited early in recorded history. A his-

toric case is that of the ancient Babylonians, as early as 2,100 B.C. (4,000 years ago) diverting water from the

Euphrates River, using it for irrigation and transportation, and discharging it into the Tigris River. Later, Herodotus recorded the instance, in 538 B.C., when Cyrus the Persian conquered Babylon by diverting the river which flowed through it, thus permitting his soldiers to gain entrance to the city, by marching through the de-watered river bed, beneath its walls. So, history was changed, somewhat, by the diversion of water.

Earlier, the Egyptians had impounded the flood waters of the River Nile, in retention basins, for later use during periods of low water, and for irrigation. This practice, which is similar to diversion, in that it changes the natural flow of the stream, is substantially the same as that now in vogue in the United States, in the Colorado, the Tennessee, the upper Missouri and the upper Mississippi Rivers.

Examples of Diversion

Water is taken from the lower Colorado River for almost every conceivable purpose. It is diverted for irrigation, for incidental farm, domestic and stock water supply, for industries, for municipalities and for power. It is taken by gravity and it is pumped. All these diversions are made with the sanction of the Federal Government. Much of the water supply of Los Angeles and San Diego, as well as many other communities in southern California, are diverted from the Colorado River and reaches the Pacific Ocean directly from those cities,

AN INAUGURAL event of the Western Society of Engineers was held on Oct. 14, 1959 in Hillside, Ill.: a West Suburban meeting. Mr. Frank Scott, Western Society trustee, gave a short after-dinner talk at the meeting, explaining the meeting's purpose, and extending the hopes entertained for other such meetings. Mr. Scott addressed the following words:

FIRST of all, I want to stress the fine organization we have in the Western Society of Engineers.

The Society is 90 years old and the fact that it has lasted so long certainly indicates that there is something to it.

The Western Society has fine downtown facilities which you can use as an engineering headquarters, and as a convenient place to meet your wife at times, and it is in many ways like a private club, as it has so many club-like features.

The Board of Direction of the Western Society, like the officers of the professional societies, recognize that in a metropolitan area you engineers have many demands made on your time, including that involved in going to and from your work and meetings. However, your participation in meetings such as those held at the Western Society Headquarters in the Loop are important—first, because it refreshes your knowledge in your own and other fields, and second, because you meet engineers from many other companies and from all over the Chicago and suburban area.

We would like to make it easier for you to attend many of these meetings,

and that is why we hope to organize a suburban section. This would save you time and effort in traveling to and from the Loop. Frankly, we are experimenting to find out how suburban meetings will work out. We have planned and are actually scheduling four such meetings, such as the one tonight. We would appreciate your suggestions on these meetings and know they will be of benefit to you and your society.

The Western Society now has approximately 2,400 members, organized into eleven sections. The sections are of all types — chemical, electrical, mechanical, and others. Each section has technical sessions, such as this meeting tonight, of the Hydraulic, Sanitary and Municipal Engineering Section. The membership of the Society is made up of men and women active in various phases of engineering, and include a large number who live in suburban communities.

So, many of us are in the same situation when it comes to attending meetings—and we certainly hope that we can carry out this idea of holding suburban meetings.

I know we can, with your help!

instead of its natural route through the Mexican waters of the Gulf of California.

New York City augments its water supply by the diversion of water from five small streams, in the state of New York, which form the source of the Delaware River. The Delaware River is the natural boundary between the states of New Jersey and Pennsylvania; and is considered to belong to those states. In the litigation concerning this diversion, the New York-New Jersey Case, before the United States Supreme Court, 1930-1931, the principle of equitable division was evolved and diversion from one watershed to another was permitted.

A project, now in dispute between the United States and Canada, is the proposal by Canada to divert some of the waters of the Columbia River, in Canada, into the Fraser River basin, in British Columbia. Apparently the power which this water can produce will be needed about 25 years hence, and there is no emergency; but the project is considered to be economically feasible, although very costly. Canada proposes to divert about 20,500 cfs, from the Columbia into the Fraser River and use it for power in British Columbia. This is about 30 per cent of the 68,500 cfs Canadian flow of the Columbia River. If this diversion and use had been planned before the Columbia River had been developed in the State of Washington, there would have been no ground for dispute; but the United States constructed its power plants, along the Columbia, in good faith, to utilize all the flow of this river. Canada's legal right to divert this Canadian water is not questioned; but it is claimed that this would violate a previous agreement between the two countries, for the use of all the waters of the Columbia River, in the United States.

Albany—Ogoki River Diversion, into the Great Lakes

Water has been diverted, from the Hudson Bay watershed, into the Great Lakes, for the past 20 years, or since 1939. For the past 15 years, 1944-1958, the annual average amount has been 5,039 cfs; and for the past five years, 1954-1958, the average has been 5,734 cfs. Slightly more than 1,000 cfs flows directly into Lake Superior, from Long Lake; and more than 4,000 cfs, annual average, flows into Lake Nipigon (elevation 852 feet) and thence down the Nipigon River into Lake Superior (elevation 602 feet). Along the Nipigon

A Chicago company has patent applications in the U.S. and 31 other countries on a low-cost, "soap and bubble" method of recovering metals from sea water, declares *Chemical Week*. Developed by a South African university professor, the method uses selected soaps to chase minerals to the surface when bubbles are blown through the water. The professor estimates it should be possible to get 600 tons of aluminum, two tons of uranium and 240 ounces of gold daily from the sea.

River, power is developed at Cameron Falls and at Alexander, total head 135 feet, and 105 feet, most at Virgin Falls remain undeveloped. Between Lake Superior and Lake Huron, all the diverted water, from both Long Lake and the Ogoki River, can be utilized for power through a 20-foot head at St. Mary's Falls. Between Lake Erie and Lake Ontario this water is used in power development, at 315-foot head; then at 88-foot head in the International Section of the St. Lawrence River, with a further fall of 135 feet to Montreal. Hence, the water diverted from the Ogoki River can be used for power, through 690 feet of head; and all by Canada except, perhaps, an equal division in the International Section of the St. Lawrence.

This diversion of more than 5,000 cfs of water into the Great Lakes has raised the levels of Lakes Michigan and Huron by more than 3 inches. It has increased navigation depths and has increased power output; but, during the high water of 1952, this increase of more than 3 inches in high water levels contributed materially to the \$60,000,000 to \$80,000,000 of damages to shore properties along Lakes Michigan and Huron. More diversion into the lakes would do likewise, would raise lake levels even higher and cause even more property damage, during the next period of high water, which most certainly will come again, about 1975. To alleviate threats of damage from high water, the diversion into Lake Superior was reduced from an average of 4,877 cfs, in 1951, to 2,533 cfs in 1952, but was back up to 4,945 cfs, in 1953. The period of high water, and damage, extended over a period much longer than one year.

In July 1956, during a Senate Hearing on a bill for a temporary increase of 1,000 cfs in the diversion of water from Lake Michigan, at Chicago, for three years, for a study of its effects, questions were asked about the possibility of increasing the diversion into the Great Lakes, from the Albany River watershed. The conclusion at this Hearing was that it might be possible, but that it had not been studied. Subsequently, a brief of

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the Hydro-Electric Power Commission of Ontario, dated May 1, 1957, submitted for the record on this legislation (published pages 14, 484-85 of the *Congressional Record* for 1957) stated:

"It is not possible to compensate for the increased diversion at Chicago by diverting additional flow into Lake Superior by way of the Long Lake and Ogoki Diversions, as all flow that can be so diverted is being diverted."

This statement made no mention of any possible diversion from the upper Albany River, by way of the Ogoki. A brief of the Province of Ontario, on the same subject, at the same time, stated:

"Our engineers advise us that such an increase is not possible, however, since virtually all the inflow from the Albany River system is being diverted to the south. The present flow is approximately 5,000 cubic feet per second and Ontario regrets that there is no way in which this can be increased."

A discussion of the contents of these briefs and allied matters, prepared August 1957, appears on pages 7725-26 of the *Congressional Record* of September 19, 1957. Later, on October 16, 1957, Anthony T. Olis, then President of the Metropolitan Sanitary District of Greater Chicago, used this material, verbatim, in a speech before the Western Society of Engineers. This speech was published in the *Midwest Engineer*, of December 1957.

The Chicago Diversion

Diversion of water from the Great Lakes watershed, at Chicago, into the Mississippi River system, began 111 years ago, in 1848, when water was first pumped from the South Branch of the Chicago River, at Bridgeport (Ashland Avenue), to serve the navigation needs of the Illinois and Michigan Canal. In 1849, water was diverted from the Little Calumet River, near Blue Island, through a navigable feeder, into the I & M Canal, at Sag. This feeder, in service until 1870, diverted an average of about 100 cfs of water and the pumps at Bridgeport about 150 cfs, making a total average diversion of about 250 cfs, from 1848 until 1870.

The Illinois and Michigan Canal was deepened, 1866-1871, at the expense of the City of Chicago, \$3,500,000, to provide a gravity flow of 1,000 cfs from

Lake Michigan, through the South Branch of the Chicago River, and through the canal. A flow of 1,000 cfs was obtained only in 1871. The next year a local flood washed about 50,000 cu. yds. of muck and silt into the I & M Canal; and the lake level dropped more than 1 foot.

The Chicago Drainage Canal was constructed, 1892-1900, flow capacity 10,000 cfs. It was opened, in January 1900, and its annual flow thereafter, water diverted from the Lake Michigan watershed, has averaged as follows:

Diversion	Pumpage	Total
1900-09	4,190 cfs	622 cfs
1910-19	6,909 "	932 "
1920-29	7,391 "	1,353 "
1930-35	6,466 "	1,669 "
1936-38	4,950 "	1,660 "
1939-48	1,523 "	1,600 "
1949-58	1,606 "	1,698 "
1958	1,498 "	1,760 "

The maximum diversion for any one year was 8,400 cfs, in 1928, when the domestic pumpage was 1,565 cfs, making a total of 9,965 cfs. This was the only year in which the full designed flow capacity of the Sanitary and Ship Canal, 10,000 cfs, was used continuously. Low lake levels, 1920-1927, reduced the flow capacity of the canal in years when all the flow possible was needed. The diversion was limited, by the decree of the

A salesman spends most of his working day in traveling, waiting for interviews, meetings, preparing reports, or on-service calls. Some 664 industrial salesmen who kept diaries of what happened in one selling day spent on the average only 42 per cent of the working day in actual face-to-face selling, *Industrial Distribution* reveals. During the three hours and 37 minutes of face-to-face selling, the salesmen averaged calls on 9.6 men in 4.7 companies.

United States Supreme Court April 21, 1930 to:

6,500 cfs, in addition to domestic pumpage, 1930-1935; 5,000 cfs, in addition to domestic pumpage, 1936-1938; 1,500 cfs, in addition to domestic pumpage, 1939 and after.

The diversion of water from the Great Lakes system has, of course, lowered lake levels, the amount of which has been computed variously, over the years, and has been much disputed. This actually has been and is much ado about very little, because variations in levels measured in fractions of an inch, or even in a few inches, mean little in lakes where the surface levels fluctuate a foot or more between winter and summer; five feet

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(Lake Michigan 4.82-ft., Lake Huron 5.02-ft.) on annual average levels; more than six feet (Lake Michigan 6.22-ft.) on monthly averages; two to three feet more than these changes, on daily averages; and even more on hourly averages.

The lowering effect, upon Lake Michigan, of a diversion of 10,000 cfs of water, at Chicago, was discussed, objectively, by many competent hydraulic engineers, before the Drainage Canal was constructed. In a discussion before the Western Society of Engineers, September 1888, George Y. Wisner, who was a member of the Board of Engineers on Deep Waterways, 1900, estimated the effect at 3.75 inches, or 0.312 ft. Lyman E. Cooley estimated it at 5 inches, or 0.417 ft. Thomas T. Johnston, the able hydraulic engineer who was responsible for the hydraulic design of the Chicago Drainage Canal, in a paper before the Western Society of Engineers, October 1894, estimated the lowering effect at less than six inches.

In the trial of the Lake States case, before the United States Supreme Court, Special Master, Charles Evans Hughes, adopted the figures of the Joint Board of Engineers on St. Lawrence Waterway Project as being the most authoritative and, in 1927, made a finding to that effect, as stated in his 1927 report to the Supreme Court. The lowering for Lake Michigan, 0.587 foot, is fairly close to the estimates of the Poe Board and O'Hanley, in 1895 and 1896, and is only 0.122-ft., or $1\frac{1}{2}$ inches, higher than the lowest estimate made, which was that of the Bixby Board, in 1913. The difference in these estimates for Lake Erie amounts to only 0.022-ft., or $\frac{1}{4}$ of one inch. The engineers on this Joint Board represented the best talent in the Army. Both General Jadwin and General Pillsbury, later, served as Chief of Engineers. Col. Pillsbury had served as head of the Lake Survey, for some years, and was familiar with the Great Lakes.

The estimates in the Berrigan Report are more than 30 per cent higher than any of the six other Army Boards; and higher than like estimates made by civilian engineers, such as Francis C. Shenehon, John R. Freeman, Gardner S. Williams, Sherman Woodward, Robert E. Horton, and others.

The differences apparently result in the increments selected for use in the study of the discharge from Lake Huron, through the St. Clair and Detroit Rivers.

Florida politicians and the Corps of Engineers are dusting off a 138-year-old idea for a barge canal across north central Florida from the Atlantic Coast near Jacksonville to the Gulf of Mexico at Yankeetown, about 85 miles north of St. Petersburg, reveals *Engineering News-Record*, McGraw-Hill publication. Cost is now estimated at \$165 million. The canal was first proposed by Gen. Andrew Jackson in 1821.

The "increment" is the increase in discharge, in cfs, for an increase of one-foot in stage. It is obtained by scaling from the discharge curve of the river, under study. In this case the curve is quite flat; almost a straight line.

The time required to effect a complete change in lake levels, or in discharge, due to a diversion, is actually infinite; but more than 99 per cent of the change in regimen is effected within 12 years. For all practical purposes, the change within the first eight years is about all that is important. In the Berrigan Report the change is assumed to be complete at the end of 15 years.

Background of Lake Level Controversy

The Sanitary District of Chicago constructed the Sanitary and Ship Canal,

1892-1900, with a nominal hydraulic capacity of 10,000 cfs, for both sanitation and navigation. As a sanitary canal, at the dilution ratio specified in the Illinois Act authorizing its construction, it would dispose of the sewage of 3,000,000 people, by dilution. This was the population attained by the Sanitary District in 1920; almost exactly the population estimated 30 years before, when the drainage Canal was designed. As a canal for navigation, from Chicago to Lockport, Illinois, across the Continental Divide, it would fit into the plans of the Federal Government, for an adequate waterway connecting the Great Lakes with the Mississippi River system.

Between 1857 and 1890, such project had been studied by seven different Army Boards, each of which reported officially upon the matter and recommended the construction of a canal, such as the Drainage Canal, with water diverted from Lake Michigan, for its supply. After the Chicago Drainage Canal was constructed, seven other Boards of Army Engineers reported officially 1900-1926, upon the connecting waterway between the Great Lakes and the Mississippi River; and all of these recommended the use of the Drainage Canal, as the most important link, with water diverted from Lake Michigan, in amounts ranging from 1,000 cfs to 10,000 cfs, for the operation of the waterway.

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The Drainage Canal was constructed, 1892-1900, flow capacity 10,000 cfs. In 1892, the Sanitary District Trustees advised the proper Governmental authorities that they proposed to improve the South Branch of the Chicago River, so as to make it a proper supply channel for the Drainage Canal; in other words, so it would have capacity to flow 10,000 cfs of water, without obstructive currents.

No Federal permit was obtained for the construction of the Drainage Canal. It was not deemed necessary.

Federal permits were obtained, from the Secretary of War, for the improvement of the Chicago River, in 1896, 1897, 1898, three in 1899 and one in 1900. This work was in progress but, by 1899, the South Branch of the Chicago River had been improved only for a safe flow of 5,000 cfs of water. It was to be 1912 before the river channel was to be adequate for a flow of 10,000 cfs. The Drainage Canal was completed in 1899 and the Sanitary District applied to the Secretary of War for a permit to open it and flow 5,000 cfs of water from Lake Michigan. This permit was granted May 8, 1899, and contained the following provision:

"that it is distinctly understood that it is the intention of the Secretary of War to submit the questions connected with the work of the Sanitary District of Chicago to Congress for consideration and final action, and that this permit shall be subject to such action as may be taken by Congress."

When the improvement of the Chicago River was completed, by 1912, adequate for a flow of 10,000 cfs, the Sanitary District applied for an enlargement of the December 5, 1901 permit and permission to divert 10,000 cfs from Lake Michigan. At an extended Hearing on this request, before Secretary of War Stimson, determined and organized opposition was expressed by navigation interests, by the Lake States and by Canada. Secretary Stimson denied the petition of the Sanitary District of Chicago, in a lengthy opinion, January 8, 1913. In this opinion five separate references were made to the fact that Congress was the proper authority to pass upon the matter of diversion of water; that the Secretary of War had only limited authority; and that only by the sanction of Congress.

Two years before this the 1909 Boundary Waters Treaty between the United States and Canada had been ratified, May 5, 1910. Under this treaty Canada was authorized to use 36,000 cfs and the United States 20,000 cfs of water from the Niagara River, for power purposes. The difference, as explained by Secretary of State, Elihu Root, was because of a reservation of 10,000 cfs of water for the Chicago Drainage Canal, which he would not permit to be mentioned in the treaty, since it came from Lake Michigan, which was not a boundary water, being entirely within the United States.

The Secretary of War, March 3, 1925, granted the Sanitary District of Chicago a permit to divert 8,500 cfs of water, in addition to domestic pumpage, until December 31, 1929, under certain conditions. The principal condition was that the Sanitary District would construct works, by 1930, to provide complete treatment for the sewage of 1,200,000 people. This was about one-fourth of the sewage treatment construction then contemplated. It was obvious that the diversion would be materially reduced in 1930.

The Sanitary District had begun the study of sewage treatment in 1909 and, after 1911, planned to provide treatment for all the sewage beyond the disposal capacity of the Drainage Canal, that is,

A new plastic lifeboat has been developed in Germany that will right itself automatically from any position, reports *International Management Digest*. The lifeboat is completely enclosed and its four hatchways can be hermetically sealed so that the lifeboat is watertight. Plastic bubble sections on the top of the lifeboat offer complete visibility.

for all sewage, or equivalent, in excess of the sewage from 3,000,000 people. Actually, the plan was to treat all of the sewage, to some extent, but to utilize the Drainage Canal to its capacity, for dilution.

A definite program was outlined, in 1923, to provide treatment for all the sewage of the Sanitary District of Chicago. Treatment was to be complete at the North Side, Calumet, Stock Yards, Corn Products, and Des Plaines Valley (Maywood) plants, with primary treatment at the West Side and Southwest Side plants. All were to be constructed by 1945. After this program had been reviewed, and approved, by an Engineering Board of Review, it was adopted, December 26, 1924, as the official policy

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of the Board of Trustees of the Sanitary District of Chicago.

Lake States Case

In 1926, the State of Wisconsin pressed a case it had previously filed in the United States Supreme Court, against the State of Illinois and the Sanitary District of Chicago, to enjoin any diversion of water from Lake Michigan, even domestic pumpage. Joined by the States of Michigan, Minnesota, Ohio, Pennsylvania, and New York, this case was tried before Charles Evans Hughes, as Special Master of the Supreme Court, from November 1926 to June 1927. Special Master Hughes filed his Report on Findings of fact and Conclusions of law with the Supreme Court, November 23, 1927. One of his findings of fact was that the diversion of water from Lake Michigan, at Chicago, had lowered the levels of Lakes Michigan-Huron six inches and the levels of Lakes Erie and Ontario five inches. One of his conclusions of law was:

"That the permit of March 3, 1925, is valid and effective according to its terms, the entire control of the diversion remaining with Congress."

Mr. Hughes recommended that the bill of the Lake States be dismissed, without prejudice.

The Supreme Court reversed Special Master Hughes, in his conclusions of law and, January 14, 1929, Taft opinion, decided that the Lake States were entitled to a decree; and re-referred the case to Special Master Hughes, to determine: what works were necessary to dispose of the Sanitary District sewage by means other than dilution; what time would be required for their construction; what reductions in diversion could be made, from time to time, pending the completion of all the plants; and "what diversion, if any, of water from Lake Michigan will be necessary for the purpose of maintaining navigation in the Chicago River, as a part of the Port of Chicago, after these sewage disposal works are in full operation."

Trial of this case, on re-reference, resulted in the Supreme Court decree of April 21, 1930, under which all the sewage treatment works were to be completed by December 31, 1938; and the diversion was to be reduced to 6,500 cfs, annual average, July 1, 1930, to 5,000 cfs December 31, 1935, and to 1,500 cfs

A tiny portable FM radio transmitter can be built from commercial parts costing only \$25, reports *Electronics*. The microphone-transmitter, powered by a standard transistor radio battery, is about the size of a deck of bridge cards and has a range of about 200 feet—just right to serve as a portable public address microphone.

December 31, 1938 and after, all in addition to domestic pumpage.

To complete the construction of this vast sewage treatment project in the time specified, proved to be a financial and physical impossibility; but the reductions in diversion were made, as decreed, to the ultimate of 1,500 cfs at the end of 1938.

The completion of the original sewage treatment construction program, 92 per cent finished early in 1939, was seriously impeded 1939-1941, by inability to secure certain critical materials needed for construction, through inability to obtain priorities for the same. Then World War II ensued and construction practically ceased. Even some of the equipment manufactured for the Sanitary District was commandeered, for use in the war effort. In the chaotic period after the war, certain materials were very scarce. Consequently, it was not until April 1950 that facilities were available for the complete treatment of all of the sewage of the Sanitary District; and even then the facilities for the disposal of the resultant sludge were inadequate.

Illinois Waterway

Construction, by the State of Illinois, of the Illinois Waterway extending 65 miles from Lockport to Utica, on the Illinois River, was started, 1919, with funds from a \$20,000,000 bond issue approved by voters at a public referendum, in 1908. These funds were exhausted before the construction was completed; and Congress, in the Rivers and Harbors Act of July 3, 1930, extended the Federal navigation project in the Illinois River up through the Illinois Waterway and the Chicago Drainage Canal and the Calumet-Sag Channel, to connect with the Federal projects in the Chicago and Calumet Rivers. In the same act, Congress appropriated \$7,500,000 to complete the Illinois Waterway; and authorized the water permitted to be diverted under the Supreme Court decree of April 21, 1930, to be used for the navigation of said Illinois Waterway. Congress also ordered a study, by the Secretary of War, of the amount of water required to meet the needs of a commercially useful waterway.

A report was filed, 1933, by Col. Dan I. Sultan (House Doc. 184, 73rd Congress, 2nd Session), stating that the diversion authorized plus the domestic pumpage, was sufficient for the direct needs, of lockage, leakage, evaporation, or in other words, for floatation; but that the amount of water needed to provide decent and healthful conditions for boat crews and river terminal operators, using the waterway, could not be determined until operating conditions were observed, for about two years, after the sewage treatment plants of the Sanitary District were completed and in service. Such a test as this has never been made.

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Recent Attempts at Legislation

In 1947, Anthony A. Olis, who had then been recently elected to the Board of Trustees of the Sanitary District of Chicago, became Chairman of a Committee, appointed by the Governor of Illinois, to study Lake Diversion. This committee investigated this subject until 1951; and then concluded that it was a matter which should be submitted to Congress. Consequently bills, authorizing additional diversion of water from Lake Michigan, at Chicago, were introduced in the House of Representatives, in the 82nd Congress, in 1952; and since this time this matter has been continuously before Congress.

During the Senate Hearings on H.R. 1, July 27, 1959, the Sanitary District agreed to certain amendments to the bill for temporary diversion, one of which would give Canada practically the veto power over any permanent diversion that might be recommended as a result of the proposed tests in the Illinois Waterway. In plain language, it means that no permanent diversion will be sought, without consultation with Canada. It might as well be said that no diversion will be made from Lake Michigan, without the consent of Canada. In 1910 our Secretary of State, Elihu Root, would not permit mention of Lake Michigan in a Boundary Waters Treaty, with Canada. He maintained that whatever pertained to Lake Michigan was a matter for the United States, only. But, times have certainly changed.

The Lake States cannot be concerned about the effect of a one-year diversion of 1,000 cfs, on either the Great Lakes or the Illinois Waterway. It would have only a trifling effect on both. They are fearful of the fact that any unbiased study will disclose the need for a permanent diversion of probably much more than 1,000 cfs, if water is to be used where it will do the most good, for the greatest numbers of people, and for our national welfare.

Representatives of the Lake States have, throughout the years of this controversy, endeavored continuously to give the impression to the public that this water is wanted for the benefit of local sanitation, whereas nothing could be farther from the actual fact. Statements have been made that the proposed temporary diversion is for the sole bene-

fit of Chicago, time after time after time, so often in fact, that simple reiteration has had its effect; and people believe it. They certainly believe it in the Lake States.

Conclusion

The real purpose of this legislation is to determine ways and means for effecting decent sanitary conditions for navigation in the upstream 50-miles of the Illinois Waterway, which is an important part of a Federal navigation project. This will not affect any sewage treatment by the Sanitary District, which must be assumed to be of the highest degree feasible.

The problem is really one for the Army Engineers, who are responsible for the operation of the Waterway, including even those portions of the Waterway built and improved by the Sanitary District of Chicago, at entirely local expense. Such portions are the Chicago Drainage Canal, the Chicago River, the Calumet-Sag Channel and the Little Calumet River. Such responsibility apparently was accepted by the Army Engineers, in 1952, when they backed this legislation, while the State Department opposed it.

It is generally recognized that the Sanitary District is now conducting the largest and most complete sewage treatment operation in the entire world. It has built and is operating the two largest activated sludge plants in the world; and such plants are the best now known in the art of sewage treatment. However, from what is now known about sewage treatment, the Sanitary District cannot be expected to treat its sewage and industrial wastes to a higher degree than 90 per cent, as an annual average. The 10 per cent of sewage solids remain-

ing after such complete sewage treatment, now, are equivalent to the raw sewage of more than 800,000 people. This figure will probably increase, as the Chicago region continues its inevitable growth. The channel, at Lockport, which receives all these wastes, left after complete sewage treatment, has an annual average flow of about 3,100 cfs, composed of the effluent from the sewage treatment plants and the present diversion of lake water.

This channel, now badly polluted, from Summit to Dresden, is truly a matter for serious consideration by the Army Engineers. It does not now appear that the pollution load can ever be much less, if any. It is much more likely to increase. The matter should be studied, now. Procrastination will lead only to a much more difficult problem, in the future.

The Mid-west, long neglected in international negotiations and trading, will suffer. The welfare of about 8,000,000 American citizens in the Chicago area, as well as the value to the nation, of the great commercial, industrial and manufacturing center, which is Chicago, is well worth fair consideration, now. Tomorrow may be too late.

The Chicago area has already done its full share and more. It has provided the most expensive and the most important parts of the Waterway. After having provided the best sewage treatment possible, in full compliance with the decree of the United States Supreme Court, is the Sanitary District, as such, concerned with, or responsible for the condition of the Federal Waterway, downstream from its borders? These are questions which will have even greater significance in the future, than now.

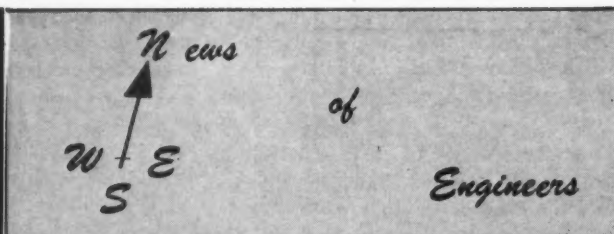
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Theodore W. Van Zelst, WSE member, has been elected as a vice-president of Cenco Instruments Corp. and a Director of Central Scientific Co.

Van Zelst is also president of Soiltest, Inc., which Cenco acquired in June of this year. Van Zelst, who was sole owner of Soiltest, started the company in 1946 while he was a graduate student at Northwestern Technological Institute.

Starting out with a small soil testing laboratory, Van Zelst entered the manufacture of engineering test apparatus. Today, the company has sales representatives in 90 countries of the world and its products are being used in 110 different countries.

Soiltest produces testing equipment for soils, concrete, asphalt, and construction materials. Cenco Instruments Corp. is one of the leading manufacturers and distributors of scientific apparatus and laboratory supplies.

Jon O. Nelson, a student member of the Western Society of Engineers, has been awarded a scholarship by Allegheny Ludlum Steel Corp. Nelson is studying metallurgical engineering at Purdue University. He is the son of WSE Member **G. R. Nelson**, manager of Heating and Air Conditioning, Northern Illinois Gas Co., at Bellwood, Ill.

Guy Louis Calhamer has announced that he has resigned as an officer and director of Gyra Electronics Corp. Mr. Calhamer stated that he preferred to return to fulltime practice as a registered architect in his new office, Suite No. 5, The LeMar Building, Forty-seventh St. East of Gilbert Ave. in La Grange, Ill.

Harry Tankus, MWSE, Wilmette, chief engineer of Seal Division of the Crane Packing Company, Morton Grove, Ill., is a contributor to the completely revised *Tool Engineers Handbook*, Second Edition.

The Handbook is a technical reference work published by the American Society

of Tool Engineers, Detroit, as an aid to chief engineers, planning heads, manufacturing executives and others connected with the manufacturing industries. The compilation work was a joint project of ASTE and industry. Twenty-six industrial committees were organized throughout the nation to assemble the material. Contributors were selected experts in tool and manufacturing engineering. The Handbook contains the latest technical data on processes, planning, estimating, machines and tool design.

Eleven per cent larger than the first edition, *The Tool Engineers Handbook*, Second Edition, consists of 2,289 pages with 1,709 illustrations and 605 tables.

The appointment of Joseph Molnar as chief industrial engineer—methods, United States Steel Corporation, has been announced by John E. Angle, vice president—industrial engineering.

At the same time he named C. C. Womack to fill Molnar's former position as

chief industrial engineer — wage and salary evaluation.

Molnar joined the National Tube Division of United States Steel in 1933, transferring to the American Steel and Wire Division in 1941.

C. C. Womack began with United States Steel in 1936 as an industrial engineer at Duquesne Works.

The election of Donald R. MacCrimmon as vice president of industrial sales and Norman I. Pickles as secretary-treasurer of the Warren Barr Supply Co., 156 N. Jefferson St., Chicago, was announced Oct. 21 by Warren Barr, president of the plumbing, heating and valve wholesale organization.

Both executives formerly were associated with Crane Co. Mr. MacCrimmon was assistant manager of Crane's Chicago branch; Mr. Pickles was an assistant treasurer.

The Barr Company operates a branch at Milwaukee in addition to its main operations in Chicago.

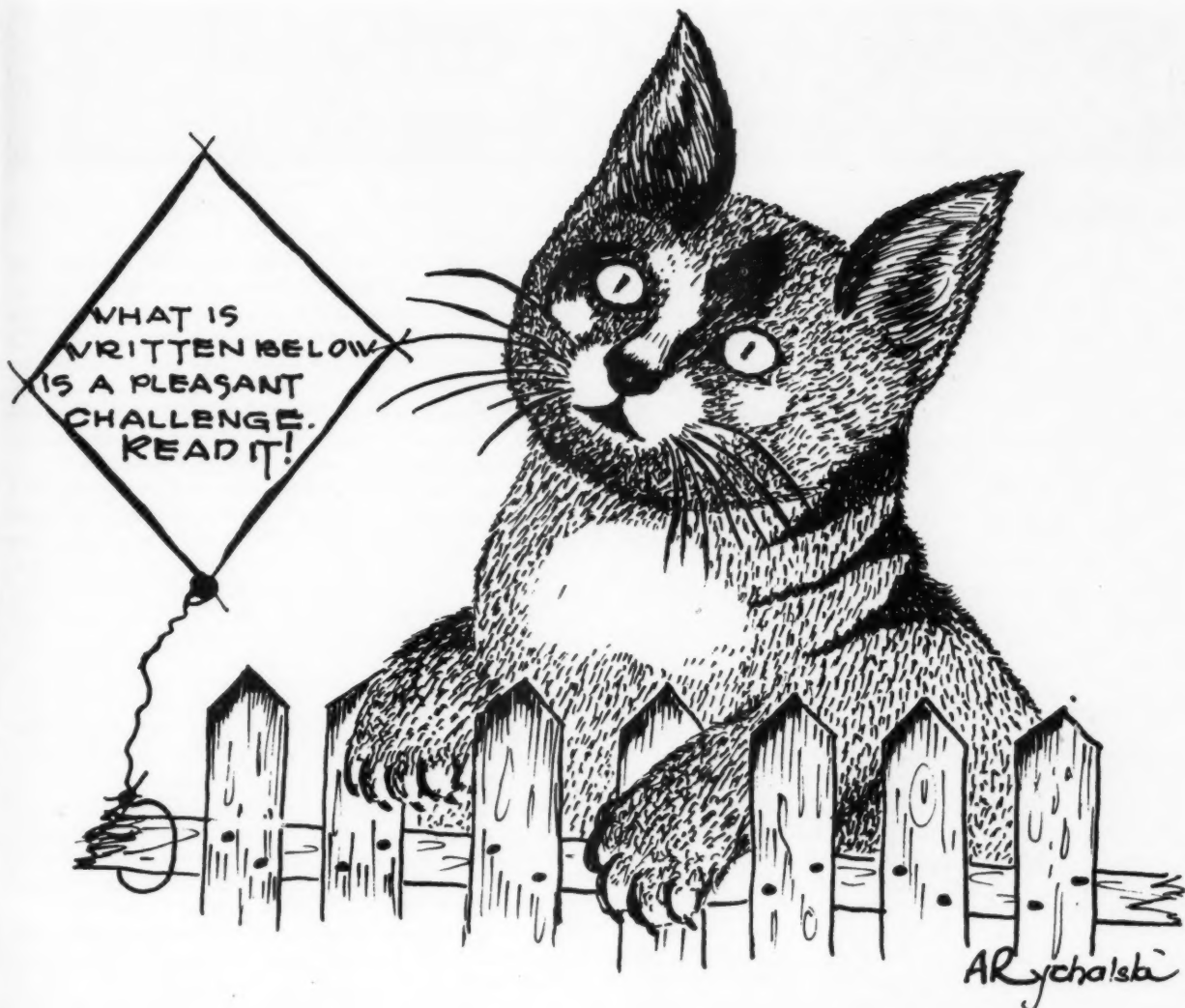
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DEAR WSE MEMBERS:

We are letting the cat out of the bag. Yes, we are admitting that without your help, the Membership Committee is a toothless old tiger. But if you help us to attain our goal set in the following "equation" we will be back on our feet. The equation: Over the top of a fence is placed a rope, the same amount on both sides. The rope weighs one-third lb. per foot. On one end of the rope hangs a cat holding a mouse and on the other end is a weight equal in weight to the weight of the cat. The mouse weighs 2 oz. per inch. The length of the rope (in feet) is equal to the age of the cat and the cat (in inches) is as much as the age of the cat's mother. The combined ages of the cat and its mother are 30 years. The weight of the cat plus one-half the weight of the cat is one-quarter as much as the sum of the weights of the weight and the rope, where all weights are in the same units. The cat's mother is one-half as old as the cat will be when it is three times as old as its mother was when she was one-half as old as the cat will be when it is twice as old as it is now. It would be good for the society if we could increase the membership by the length of the mouse times twice the combined ages of the cat and its mother. The answer to this "equation" is our goal—345 new members. You should have a lot of fun solving the equation.

THE MEMBERSHIP COMMITTEE

Reviews of Technical Books



The Efficient Executive

The Efficient Executive, by Auren Uris, Research Institute of America; McGraw-Hill Book Company, Inc., New York 36, New York. Pages, 308. Price, \$4.95.

The Efficient Executive presents scientific methods for executive action. This new approach to a job divides working time into major types of activity and suggests systematic approaches to each type. The recommendations are based on recent studies, experiments, and many practices of today's most successful executives.

Auren Uris describes many modern executive techniques including: methods for getting more free time for creative planning, solutions for the paperwork problem, suggestions for increasing effectiveness of a staff, solutions to personality clashes, group interview methods, designs for office layouts, and many more.

This book is a valuable asset for the library for executives and aspiring executives.

Asphalt Pavements

Design and Construction of Asphalt Pavements, by J. Rogers Martin, engineer manager, Hot Mix Asphalt Concrete Association of Oklahoma, and Hugh A. Wallace, managing engineer, Southwest Division, The Asphalt Institute. McGraw-Hill Book Company, Inc., New York 36, New York. Pages, 298. Charts, tables, and illustrations, 219. Price, \$11.50.

Design and Construction of Asphalt Pavements covers in detail the types of equipment used today in the planning, testing, preparation, and laying of modern asphalt pavements. The authors describe portable crushing and screening plants for processing limestone-base material, large capacity batch-type hot-mix asphalt plants, mechanical finishing machines, stabilizers, rollers, mechanical loaders, and many other types of apparatus used in modern paving.

The chapter titles are as follows: Types of Asphalt Pavements, Petroleum Asphalts, Mineral Aggregates Design of Hot-Mix Asphaltic Concrete, Construction of Hot-Mix Asphaltic-Concrete Pavement, Asphaltic Pavements and Bases Employing Liquid Asphalts, Asphalt Surface Treatments and Seal Coats, Reconstruction of Old Pavements, Design of Flexible Systems, Testing Exercises, Mix-design Methods, and Useful Tables and Their Application.

Water Facts

Water Facts for the Nation's Future, by Walter B. Langbein and William G. Hoyt. The Ronald Press Company, New York 10, New York. Pages, 288. Price, \$5.00.

This book provides an authoritative analysis of existing federal and state hydrologic programs and discusses the apparent increased needs for water in the future. Specific

steps are outlined on conservation and water management of present and future water resources.

The present mapping program is discussed, and a chapter is devoted to the question of design of an adequate national hydrologic network. Problems on water control, utilization and financing of basic data programs are explained.

The contents include numerous helpful figures, graphs, and tables which will aid engineers, administrators, and regional planners in discerning hydrologic data. Phases of water management treated are irrigation, flood control, stream-flow forecasting and waste-water disposal.

The chapters on hydro-economics and town, city, and industrial problems evaluate economic feasibility of engineering projects. Also, three kinds of water problems—water supplies, storm water drainage, and flood-plain zoning—have been selected to demonstrate how basic data can aid in these decisions. In addition, each of these examples also provides a lesson for improving the usefulness of basic data.

Nomography

Nomography, by Alexander S. Levens, published by John Wiley & Sons, Inc., New York 16, N.Y. Second edition, 1959. Pages, 296. Price, \$8.50.

The use of nomograms has spread so widely in the past decade, that Alexander S. Levens' *Nomography* has nearly doubled its pagination in order to keep pace. The second edition of this practical volume contains 296 pages as compared to the 1943 edition which contained only 184.

Even at that time, *Nomography* was considered one of the clearest expositions of the basic theory and construction of charts involving straight line scales, curved scales, and combinations of the two. The 1959 edition recognizes that from the launching of a satellite to the more mundane realm of food technology, nomographs are apt to be called to the rescue. Statistics, electronics, ballistics, heat transfer, radioactivity, medicine, the physical and biological sciences, engineering, and business are only a few of the fields in which nomographs are constructed today. To all of these, Professor Levens (University of California in Berkeley) directs his work.

The second edition of *Nomography* has three new chapters on circular nomograms, projective transformations, and the relationship between concurrency (Cartesian) and alignment nomographs with applications to experimental data. Three earlier chapters have been expanded to include: methods for designing nomographs for four variables without the need of a turning axis; material on nomograms which consist of two curved scales and a straight line scale, and three curved scales; and a more extensive treatment of the use of determinants. Professor Levens has also simplified the mathematical developments for the various type forms throughout the book, and introduced many new problems and examples, in addition to other up-to-date material.

"Piracy" Charges Called Foundationless

Charges of "piracy" in the hiring of engineers, of fantastic turnover rates among companies that hire engineers, and of fabulous parties designed to lure them away from the competition, are largely without foundation.

This is the conclusion of an extensive survey undertaken by *Product Engineering*, which was reported in the Nov. 2 issue of the magazine.

Large and small companies, nationwide, that hire engineers—as well as placement facilities of engineering societies, engineering consultants, and others were questioned by the magazine, in an effort to pin down widely circulated reports of a chaotic situation in regard to engineers.

Less than 1 in 10

Engineers changing jobs next year, the survey reveals, will be less than one in ten. That one probably will make the change for a better working atmosphere, a more challenging assignment, rather than a phenomenal increase in salary or pie-in-the-sky promises.

Today's engineer, the survey found, is a rather substantial fellow who is looking for opportunity, growth potential, perhaps a private office and a title. Once he finds a place that offers him about what he's after, he settles down, becomes active in his community, and isn't anxious to move. He shows no interest in hoping from one job to another, assuming he's kept reasonably happy where he is.

Companies are expanding, and are always faced with the difficult problem of finding top engineers—those with exceptional ability and considerable experience. But by and large, ethical practices are the rule. Recruitment advertising emphasizes technical opportunity, not salary or the idyllic life. Examination of the ads shows they seek men mostly for top positions in specialty fields.

J. R. Dekker, western representative of the Engineering Societies Personnel Service, estimates that ten per cent of all engineers change jobs each year. In the 11-state area he serves, there are about 150,000 engineers; about 15,000 of them shift jobs each year, and about 1,500 use employment agencies. A survey of 387 companies by the Engineers Joint Council shows that turnover in industry in 1957 for all reasons was 11

per cent; last year, it was approximately nine per cent.

Companies say engineers have learned that there is no perfect job, and companies make a special effort to hire engineers they think are likely to stay, and then provide incentives for staying. The employment supervisor of a California company says one incentive is a growing company. Engineers in such a firm find many individual success stories there and realize that what others have attained is possible also for them. Variety of work and mobility within the company, fringe benefits, such as opportunity to participate in stock ownership and profit sharing benefits, are other inducements.

Also contributing is a more realistic approach to interviewing. The applicant may be given a tour of the plant and his potential work area, a chance to talk informally with other engineers, without the boss present, so that he knows about what he will get before he reaches a decision.

Advertising Used

Companies continue to use newspaper advertising, recruiting teams in major cities, suites at professional and trade shows, employment agencies, college visits, and word-of-mouth. Firms in the East find newspaper advertising especially effective. Persistent advertising keeps the company in mind and creates an image, so that when an engineer is ready to make a change, the company will come to mind. But instead of talking in glowing, but vague terms, ads now give facts: job description, community facilities, such as schools. Some companies attempt to solve recruiting problems by getting the young man early.

Companies reporting said recruiting costs averaged between \$1000 and \$15,000 annually. Some felt the cost could be cut drastically by modernizing methods.

The charge of piracy is made less frequently. (When someone gets a man from you, it's piracy. When you get a man from someone else, it's honest American competition.) At least one West Coast aircraft company refuses to hire engineers who are employed by other aircraft firms. Recruiting at professional meetings is more subdued. Many societies—the ASME for one—

prohibit recruiting in hotels where meetings are being held. Dignity and prudence are now the watchwords, and everyone will benefit, the magazine declares.

Contradiction Of Terms

The village of Industry, Ill. has reported that it has no industry.

This was revealed in the Illinois Manufacturers Directory's annual survey of the state's 1,300 cities, towns and villages. The number of municipalities containing some form of manufacturing or processing increased from 652 to more than 675, according to the Directory's preliminary figures.

Estimated number of Illinois factories and plants in operation during the survey month of September, 1959, is 22,300.

Publication of the 1960 volume, containing the names and titles of Illinois' 91,000 manufacturing executives, is scheduled for March, 1960.

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New Products

As described by their Manufacturers

V-dot Indicators

Designed primarily for use in shipping missiles, electronic parts, and other delicate instruments, new V-dot indicators developed by Inertia Switch, Inc., New York, determine if rough or careless handling has caused a shock to the shipment. V-Dot Indicators give visible indication when shock has exceeded a predetermined permissible limit that may have caused damage to the cargo.

These unique detection devices have complete spherical sensitivity; units are also available having one or two plane sensitivity with an accuracy of 5% of pre-set value; available from 5G to 75G, in standard models. Meet typical Military environmental specifications.

V-Dot Indicators are reusable, having life expectancies of about 5 years. Units are resettable and protected against tampering with inspectors' seals. Bulletins, prices, application data available from the maker, Inertia Switch, Inc., Packaging Protection Div., 311 West 43rd St., New York 36.

Drafting Table

A totally new kind of drafting table is described in a bulletin (#SU-620) just released by Stacor Equipment Company, manufacturers of drafting room furniture. The new Stacor Unic is made in France, and is distributed in the United States and possessions exclusively by Stacor. Its revolutionary design features precision engineered floating-board action, so that it literally floats into any desired position and holds securely without wobbling.

A counterweight mechanism, operated by foot pedals, balances the new Stacor Unic perfectly. The draftsman can work on any part of the board without stretching, stooping or straining, in a seated or standing position. A multi-disc friction device locks and unlocks the Unic board to make height and slope simultaneously adjustable. Heavy-gauge, electrically welded frame and parts assure absolute rigidity in any desired position.

Copies of the new, descriptive bulletin, prices, etc., are available from Stacor Equipment Company, 295 Emmet Street, Newark 5, N. J.

g Switch

A timed-action latching g switch designed to activate automatically many critical operations aboard a soaring rocket or missile has been developed by Inertia Switch, Inc., New York.

The 6UO-115 is described by the manufacturer, as the smallest, precision-made timed-action latching g switch. Simple in concept and design, it has just one moving part—a precision ground steel ball held in place by a two-pole magnetic field. The switch can be set to respond to acceleration forces from 1 to 40 gs within a tolerance of $\pm 5\%$ of the setting. Time delays can be adjusted between 0.5 and 1.5 seconds.

When an axial acceleration force exceeds the pull of the magnet the ball is released and moves to close the 6UO-115's normally open electrical contact.

The switch is also available without latching or without a timed-action. The 6UO-115 meets all the environmental specifications of MIL-E-5272, including an operating temperature range of -65°F . to 200°F .

Bulletin, prices, additional information: available from Inertia Switch, Inc., 311 West 43 Street, New York 36.

Literature

Overload Detector

A bulletin just issued by Wintriss, Inc., describes their Circuit Master Mark III overload detector that literally eliminates costly die damage due to overload misfeed, buckling, pile-up, end-of-material or other malfunction. Designed to protect the entire die, this low-cost electronic unit operates completely automatically.

The bulletin details each phase of operation. By directly measuring normal die shut height, the Circuit Master instantly senses any change, even though it is measured in micrements of thousandths of an inch, and immediately stops the press *before* the die strikes again. A built-in compensator unit allows for material thickness variations, temperature changes, voltage fluctuations, mechanical wear and other gradually changing factors. No adjustments are

necessary at any time and there are no controls to set.

This fully automatic overall die protection unit, the bulletin points out, may be used on power presses or any reciprocal motion equipment where the closed position of the dies are fixed or of consistent shut height. Attachments are available for added control of auxiliary motions. The many special features, various applications, manner of installation, etc., of Circuit Master Mark III are also well illustrated and diagrammed in the bulletin.

Copies of the bulletin as well as prices available from Wintriss, Inc., 20 Vandam Street, New York 13, N. Y.

Diesel Data Sheet

Distilled from years of specialized experience, the charts and diagrams give clear, easy-to-read recommendations for engine exhaust, air intake and oil lines that require flexible, leakproof connections to compensate for vibration, expansion, offset, misalignment and other problems. Many typical installations are helpfully diagrammed. Some of these are 90° permanent bends (all hose or with elbows), lateral and vertical offset, expansion and contraction.

The convenient check list, enumerating important size and application information, will enable users to call upon Allied's expert engineering staff for specifications and suggestions on both standard and specialized installations.

Copies of the 10-X-552 Diesel Data Sheet are available from the Allied Metal Hose Company, 3753 Ninth Street, Long Island City 1, N. Y.

Heat Exchange

Engineers and purchasing agents associated with the design and manufacture of heat exchanger equipment used in the process industries will be interested in a new technical bulletin published by the Tubular Products division of The Babcock & Wilcox Company. The bulletin describes all the attributes of B&W's new line of Lectrosonic heat exchanger tubes, demonstrating how quality controlled manufacturing procedures provide for good fit in tube sheets, ease of fabrication and optimum fluid flow. Field service tests of the product indicate this line of welded steel tubing is equal to and superior to seamless steel tubing and offers savings in cost of 10.8 to 32.2 per cent. Identified as bulletin TB-431,

the eight page folder is available upon request to the division's sales headquarters at Beaver Falls, Pa.

Concrete Testing

Soiltest, Inc., Chicago, has just published a four-page bulletin on the company's new portable, 250,000-pound concrete testing machine.

The illustrated booklet contains complete specifications on the new apparatus, which was introduced recently. The Tester makes it possible to test concrete right on the job site, as well as in the laboratory.

Also contained in the booklet are photographs and information on accessory equipment for use with the concrete tester, such as a concrete safety guard, capping sets, cylinder carrier, and compound warmer.

Copies of the bulletin may be obtained free of charge by writing to Soiltest, Inc., 4711 W. North Avenue, Chicago 39, Illinois.

Bulk Material Handling

A new 16-page brochure by Sauerman Bros., Inc. covers the handling of ores, sand and gravel, chemicals and other bulk materials by Sauerman Machines.

A brief history of the company is given in two introductory pages. Four pictorial sections show DragScraper and Cableway applications for Excavating and Hauling; Storage and Reclamation; Engineering and Construction; and the Marine field.

Sauerman Bros., Inc., 620 S. 28th Avenue, Dept. M-1, Bellwood, Illinois.

Precision Measuring

Scherr-Tumico announces their new 1959-60 Guide & Catalog of Precision Measuring Tools and Instruments consisting of 96 fully illustrated pages is now available.

This catalog contains complete detailed information on Scherr Measuring Tools and Toolroom Specialties, such as a complete line of Micrometers, Vernier Depth Gages, Snap Gages, Protractors, Dial Indicators, Ultra-Chex Gage Block Sets, Height Gages, Speed Indicators, Hand Tachometers, Dynamometers, Radius Dressers, Optical Flats, Surface Plates, Magni-Ray, Illuminated Magnifiers.

Also illustrated is a complete line of Zeiss Indicating Micrometers and Com-

parators, Zeiss Orthotest, Scherr Micro-Projector, Cycloptic Stereoscopic Microscope, Scherr Toolmakers' Microscope, Spur Gear Tester, Parkson Gear Tester, Kesel Circular and Linear Dividing Machines, Profiling, Engraving and Milling Automatics, Cima Universal Gear Hobber, Cornelis Thread Generating Machine, Opto Tooling Auto Collimator, OMT Optical Rotary Indexing Table, Zeiss Optical Precision Measuring Instruments.

This complete illustrated 96 page catalog may be obtained by writing direct to Scherr-Tumico, 200 Lafayette St., New York 12, N. Y.

Safety Hats

A thoroughly illustrated four page bulletin on safety hats and caps has been published by Flood Safety Products Co. of Chicago.

The bulletin describes a completely new line of hats and caps by Flood, and available in fibre-glass, aluminum or plastic-electrical shells.

The new Flood safety hat and cap line features a unique plastic-zippered polyethylene suspension which is easily removed for cleaning and sterilization.

An important feature of the suspension system in the new Flood line is that it tightens to the hat shell on impact, rather than loosen, providing extraordinary safety.

The new Flood bulletin contains illustrations of all hat and cap models, and includes a full list of hat and cap accessories by part number.

The bulletin, No. 18, may be obtained without obligation from Flood Safety Products Co., 3035-37 W. Lake Street, Chicago 12, Ill.

Festive, Fireproof Trees

Festive, fireproof Christmas trees of aluminum will add a new note to yuletide decorations in thousands of homes this holiday season.

The glittering trees, available in a wide range of sizes, are made of durable, non-tarnishing Reynolds aluminum by Star Band Company of Portsmouth, Va., and Aluminum Specialty Company of Manitowoc, Wis.

The trees come in kit form, ready for easy assembly by inserting the branches into pre-drilled "trunks" in a sturdy base. After Christmas, they can be disassembled and stored for re-use season after season.

The trees present a host of advantages to Santas of all ages. They are sturdy, flameproof and never drop their needles;

they eliminate the problem of finding a straight, full-branched tree; they suggest new ideas in ornamentation and lighting; and, because they are aluminum, the first investment is the last.

A Backward Glance

A new automobile rearview mirror—more than twice the view of present mirrors although the new mirror is only two inches longer than today's average one, reports *Fleet Owner*. The periscope uses a 24-inch cylindrical lens two inches high, another lens, a 15-inch square mirror and the driver's mirror. All units, except the driver's glass are set in the roof of the car.

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MECHANICAL PROBLEMS IN PROCESSING REACTOR FUELS

Reactor fuels are processed to remove impurities (fission products), replace burnt fuel and recover plutonium. In the last few years at Argonne National Laboratories and other places, fuel processing by metallurgical means, such as melting, oxidation, molten metal extraction, crystallization, etc., have been investigated. Results have been sufficiently promising to incorporate a complete fuel-reprocessing plant in a Reactor Power Station at the U.S. Reactor Testing Station at Arco, Idaho. This plant is called the Experimental Breeder Reactor II (EBR-II) and is now under construction.

At Argonne I am attached to the Design Group of the Chemical Engineering Division. We have the responsibility for the design of the Fuel Cycle Facility and the associated equipment, as well as for the design of the process equipment for recovering the fuel. Other divisions at Argonne have the responsibility for designing the equipment used in this facility for disassembly and refabrication.

The fuel when removed from the reactor will be extremely radioactive. A 10-kg charge of fuel will produce a radiation level of 10^7 r/hr at a distance of one foot. By comparison the fatal dose of radiation for a human being is of the order of 500 to 1000 roentgen.

The spent fuel will be self-heating because of the radiation to the extent of 2 KW per charge of 10 kg.

In addition, uranium and plutonium are highly pyrophoric. The spent fuel will therefore oxidize rapidly if exposed to air, or burst into flame.

At all steps in handling and reprocessing, as well as refabrication of the fuel, it must be kept in sealed containers or under an inert dry atmosphere. Even after reprocessing, the fuel will still retain about a third of its radioactivity, making personnel protection absolutely mandatory.

It was therefore decided to provide a heavily shielded, hermetically sealed cell containing a very pure, dry, inert argon atmosphere in which the pyrometallurgical processing could take place. A

more conventional air-ventilated cell equally heavily shielded will be used for disassembly and reassembly of fuel sub-assemblies.

Since it is going to be an experimental facility suitable for a variety of equipment, much of which still remains to be designed, a great degree of flexibility is desirable.

Direct maintenance of equipment in the Argon Cell would be practically impossible, since it would require replacement of the argon atmosphere and decontamination to a point where personnel could enter the cell—operations that would be costly and take months to do.

It therefore became clear that processing equipment, as well as cranes and manipulators, had to be kept running for years without anybody ever entering the cell.

This is a more severe requirement than at any other existing facility for fuel processing, but if it can be carried out, it might prove a lot more economical, because of the potential savings of the pyrometallurgical processes.

Closed Fuel Cycle

The EBR-II will be the first reactor in the United States to operate on a closed fuel cycle. The Processing Plant, including the melt refining and remote fuel fabrication processes, represents a new approach to the problem of low cost fuel recovery. We hope that the operation of the EBR-II facility will demonstrate the technical feasibility of this fuel cycle and provide data for engineering and economic evaluation.

Briefly, the fuel consists of enriched uranium pins in hermetically sealed stainless steel tubes. Ninety-one of these are mounted in a sub-assembly and 47 sub-assemblies constitute a charge to the reactor.

The steps to be performed by remote control in the heavily shielded cells consist of disassembling a sub-assembly, removing the stainless steel tubes, melting the uranium pins, recasting the uranium into new fuel pins, inserting the pins in new stainless steel tubes, and re-assembling the tubes into sub-assemblies.

Summary of a talk presented by Johan Graae, Sr. Mechanical Engineer, Argonne National Laboratories, Lemont, Ill., to Western Society of Engineers, Sept. 29, 1959.

The disassembly and re-assembly is performed in the air-ventilated cell and the melting and recasting of the uranium fuel takes place in the hermetically sealed argon atmosphere cell. The Air Cell is rectangular, 15 feet wide by 47 feet long and 21 feet high, shielded by 5 feet of high density concrete walls.

The Argon Cell is circular or doughnut shaped, 62 feet inside diameter and 22'6" high inside, also shielded by 5 feet of high density concrete. All inside walls, ceiling and floor are covered by a $\frac{1}{4}$ " thick steel liner, seal welded to form a hermetic enclosure.

The cell atmosphere specification calls for a very pure argon gas containing a maximum of moisture of 5 parts per million, 100 ppm max. of oxygen and 5 per cent nitrogen. In order to maintain this purity without extensive purification equipment, the total cell in-leakage is specified to be 0.01 CFM. This requires extremely high quality welding of the liner and careful sealing or gasketing of all openings through the shielding walls and steel liner (such as windows, transfer locks, etc.).

The circular design was chosen because it provides the best possible viewing of equipment inside the cell through 5-foot thick shielding glass windows located in the 5-foot thick shielding walls. It also facilitates the problem of feeding power and control to the two overhead cranes and six manipulators which pivot around the center of the cell, much as the hands on a clock revolve. The cranes are connected to the outside controls through brushes and slip-rings around a center post, and the manipulators are fed through flexible, multi-conductor cables hanging down through the center post. Cranes are located at an elevation above the manipulators, so that they can revolve indefinitely, whereas manipulators are confined to $1\frac{1}{2}$ revolutions because of the cables. This should be adequate, since normally each manipulator will be restrained to operate only a section of the cell. The manipulator carriages and the crane trolleys can be removed from

their bridges by simply lifting and lowering vertically. Guides ensure correct positioning of these parts. This lifting and lowering is done by a special hoist which is located on the roof of the Argon Cell and normally sealed from this cell by means of a mercury sealed valve. Thus, direct maintenance or repair can be done on this hoist from the outside.

Bridge motor-drives are also removable vertically using the same hoist.

Only the structural steel bridges with their wheels will be inaccessible for remote maintenance, but it is felt that with careful design and good mechanical execution, these items should be able to function for years without attention. Added safety is provided in the number of cranes and manipulators installed.

Maintenance of carriages, trolleys and bridge drives can be performed when these items have been lifted off the bridges and lowered to the cell floor. If necessary, the equipment can be transferred out of the Argon Cell through special transfer locks to the air-ventilated cell and repaired or replaced.

Manipulator Carriage

The photograph shows a manipulator carriage lifted off its bridge. This manipulator has been developed specially for this Fuel Cycle Facility and contains many novel features, particularly the componentized design which permits removal of individual motor-drive assemblies for maintenance or replacement.

All the motors, gear boxes and solenoids required for the operation of this carriage and the telescoping arm are located in the lead-shielded steel carriage. The arm can be extended and rotated and the double-hook shown can be opened and closed. This double-hook can be replaced with a parallel-jawed grip. The replacement is performed by the manipulator itself, aided by a special stand holding the hook, grip and other tools required. Electric pick-up brush assemblies for power and control are seen on the bottom of the carriage. These brushes engage bus bars on the bridge automatically as the carriage is lowered into position on the bridge.

Processing and fabricating equipment varies greatly in complexity and basic design philosophy. One approach has been to make this equipment as simple as possible with few moving parts and with all operations performed with the manipulators. Another has been to pro-

vide the equipment with its own power and only use the manipulators for maintenance. In both cases each piece of equipment has been composed of several sub-assemblies which can be removed or replaced individually.

In the design of this Fuel Cycle Facility we have, in addition to purely mechanical design of the facility and its equipment, had to face many problems due to the rather unique combination of the operating conditions involved.

For example, the very dry inert atmosphere and very high radiation level requires either lead shielding of bearings or the use of special lubricants. Commutators and brushes must be of special material to avoid excessive wear in the dry argon atmosphere. Electrical insulation where exposed to radiation must be inorganic. The argon atmosphere must be continuously purified and cooled, etc.

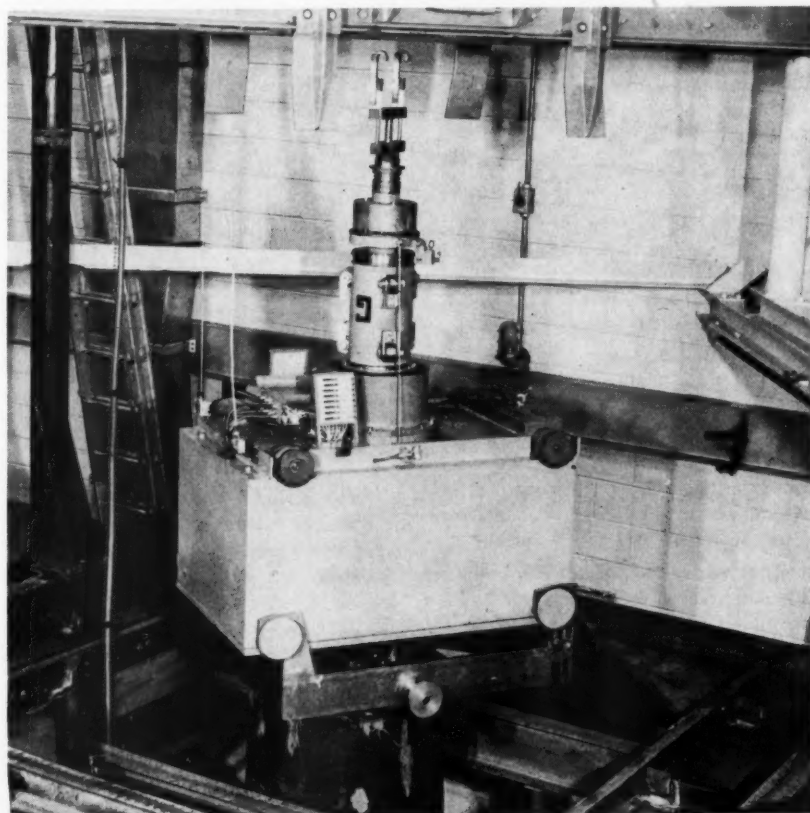
The melt refining and remote fuel fabrication processes are both new and cannot be completely tested until the reactor and process plant is in actual

operation. The combination of heavy shielding and a dry inert atmosphere in a hermetically sealed process cell is also new.

Remote handling techniques ordinarily suitable for controlled atmosphere boxes could not be used, because of the intense gamma radiation.

Wherever practical, standard commercial equipment has been selected and modified as required to suit the special conditions. A great portion of the equipment is developed especially for this particular plant and cannot be fully evaluated until operating experience is gained.

We feel, however, that the design of the plant and the handling equipment is sufficiently flexible to permit modifications to the fuel element or to the processes by replacement of process equipment items by ones of different design. Even crane-trolleys and manipulator carriages can be replaced with ones of different or more advanced design without the need of replacing the argon atmosphere or decontamination of the cells.



Mechanical Manipulator Carriage, photographed in mock-up where equipment for the EBR-II Fuel Cycle Facility is tested.

Roddewig Addresses Civic Committee

The Civic Committee of the Western Society of Engineers held its first meeting of the current season on Oct. 21 at WSE Headquarters in Chicago.

Chairman Loren Trimble welcomed the Committee members, then introduced Clair M. Roddewig, president of the Association of Western Railroads and chairman of the Chicago Plan Commission.

Roddewig's Address

The following is a summary of Mr. Roddewig's address:

"This is the fifth year of the Chicago Plan Commission as it is now constituted. The first Planning Commission was organized in 1909. It was responsible for the Burnham Plan. This plan was confined more to the aesthetic development of the City and took in such things as beautifying the Lake Front, more recreational areas, parkways, etc. We are all acquainted with the progress that has been made in furthering this plan.

"The questions considered by the Plan Commission today, however, are of a more mundane or practical nature. We are considering how to preserve what we have in the City that is good and how to improve that which is deteriorated.

"In 1957, the City organized the Department of City Planning. This Department was charged not only with planning but with the authority to coordinate the implementation of these plans with other city departments.

"The citizens' committee, which previously did all the planning, could not hope to be as effective as the new department because it lacked this authority for coordination. The citizens' committee is used today in an advisory capacity by the Department.

"Last year, the Department published the comprehensive 'Development Plan for the Central Area of Chicago.'

"This assertion of intention has already achieved some remarkable developments in the Loop area. Developers no longer hesitate because they now know that there is a great future planned for the Loop. The Federal government has indicated its intention of building a new Federal building at the site of the old post office. Also there is considerable

interest in a new government building at the site of the City Hall.

"The program for the next five years calls for a complete study for each part of the City.

"Our central plan envisages 50,000 housing units in the central area. This is a departure from previous planning, but we feel that a residential population is required if we are to maintain the retail area in the Loop. The 50,000 housing units will provide a population of about 250,000 people. We feel that Chicago, to remain strong, needs a vital central area.

"Within the last week, the capital improvement program for the next five years was submitted to the Plan Commission who are now studying and questioning the various departments in accordance with their part in this program. We must submit our recommendation to the Council and the Mayor by the end of the year. Our report must include how it fits into the overall planning for Chicago.

"I must reaffirm, however, that we can only consult and advise. We cannot overrule any department.

"If you would like a copy of this year's capital improvement program, write to the Department of City Planning.

"A breakdown of the major items comprising the \$751,000,000 program is as follows:

\$147,000,000	Expressways
114,000,000	O'Hare Field
71,000,000	Sewer Extensions
65,000,000	Filtration Plant
69,000,000	Bridges and Viaducts
64,000,000	Street Lighting

"The \$64,000,000 for street lighting will complete the Chicago street lighting program, which will have cost a total of \$155,000,000.

"The funds required for this program do not all come through the City. Part of them come from matching funds from the Federal and State governments. \$235,000,000 will come from general obligation bonds and \$240,000,000 from revenue bonds.

"Chicago is in a very good position for obtaining money on general obligation bonds. It has a preferred credit position and it is the City's intention to

maintain that rating. At the present time, Chicago is \$236,000,000 under its maximum permissible borrowing power. In the next five years, we contemplate borrowing another \$235,000,000, but at the same time, we will pay off \$100,000,000. Then, of course, growth will boost our maximum allowable borrowing power.

"In conclusion, I would like to say that it is my firm belief that the City's capital improvement program is a very reasonably managed program."

Rubber Dam

The Los Angeles Department of Water and Power has invented a collapsible synthetic rubber tube dam that saves it about \$75,000 worth of water annually, according to *Power*. Water fills the 150-foot-long tube dam, which is fastened to a channel bottom, and inflates it about five feet high. When flood waters reach a given height, the tube drains and collapses, allowing the flood to pass.

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Highways Division Men Win Awards

Two bridge design engineers for the Illinois Division of Highways have been named as winners of a \$1,000 third honorable mention award in the Steel Highway Bridge Design Competition sponsored by American Bridge Division, U. S. Steel. Tsu-Ming Yang, and Muhittin Ozyurt, both of Springfield, Illinois, share the cash award for their joint professional entry.

The competition, which offered 15 professional and student awards totaling \$44,000, attracted 300 entries from the nation and abroad. The contest was held and judged under the auspices of the American Institute of Steel Construction.

Object of Event

Object of the event was "to stimulate more imaginative, effective, and economical use of strong, modern steels in overpass structures that must bridge superhighways at frequent intervals."

It is estimated that more than 41,000 bridges will be needed for the network of interstate and defense highways the nation will build in the next 15 years.

Consideration for the safety of highway travelers enhances the original, economical, and appearance features of Mr. Yang's and Mr. Ozyurt's award-winning design.

Their plans show a wide-flange beam bridge which passes over a divided highway in a continuous span. The design does not require a supporting pier in the center of the span.

Absence of a support in the median strip benefits the high-speed highway traveler in two ways: it removes a potential safety hazard, and it gives a clear view of the road ahead.

The award-winning design requires 59 tons of steel. It makes use of five lines of stringers and has a main span of 91 feet, 6 inches long. Total bridge length is 194 feet, 11 inches. The composite-action roadway deck supported by the steel structure contains 181 cu. yds. of concrete.

In commenting on the outstanding features of their award-winning entry, Mr. Yang and Mr. Ozyurt feel that have initiated a new design technique that will eliminate a considerable amount of uplift and redistribution of deadload moments.

In their opinion, the technique will lead to more economical design of certain steel highway bridges. In particular, the designers refer to bridges of the continuous type, saying that, "heretofore certain designs have been uneconomical because they involve a large unbalanced ratio between the center span and the end span." (The ratio in the Yang-Ozyurt entry is 2.88 to 1.)

The designers say they chose the I-

beam type super-structure for having:

"More effective vertical clearance for grade separation structures on level terrain than those of haunched girder or arch-type . . . more simplicity in shop fabrication . . . fast erection in the field, and adaptability for future widening."

Among other features they note that "all the advantages of continuity have been incorporated to improve the economy of the structure."

Seek BOD Measuring Method

Simplified methods of assessing water quality are the goal of a University of Cincinnati research project announced by Dr. Louis M. Laushey, head of the university's civil engineering department.

The new study will be supported by a grant of \$8,165 from the United States Public Health Service. The initial grant is for one year, with assurance of continued support the following year.

J. D. Eye, associate professor of sanitary engineering at the university, will be principal investigator. This will be a project of the sanitary engineering division of Dr. Laushey's department.

Preservation of Fish Life

Results of the project may indirectly contribute to preservation of fish life and maintenance of pure water supplies.

Project objective will be to develop a more practical, effective method of measuring and recording the biochemical oxygen demand (BOD) of sewage and other organic wastes.

Before these wastes are dumped into streams and rivers, Professor Eye explained, they must be treated to reduce BOD. Otherwise they may deplete the oxygen in the stream to a level at which fish cannot survive and water may become unfit for domestic and industrial uses.

Present chemical tests for obtaining necessary BOD data are cumbersome and time-consuming, Professor Eye said.

In the project, BOD testing will be done instrumentally, using a stationary, plastic-coated platinum electrode.

Working with Professor Eye on the project this year will be Krishnaswamiengar Keshavan, research fellow in sanitary engineering, who received his

master of science degree in sanitary engineering from the State University of Iowa.

Basic research which made the grant possible was carried out last year by LeRoy H. Reuter, who received his civil engineering degree in 1958 and master of science in sanitary engineering in 1959 from the University of Cincinnati. His work on the project was done for his master's thesis.

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Electric Car May Be "Car-of-the-future"

The electric car, which passed from the American scene in the 1920's may be on its way back, modernized and transformed into the "car-of-the-future."

The possible renaissance of the battery-driven automobile has nothing to do with nostalgia for the good old days. It's simply a matter of economics. The electric car of tomorrow, as visualized by visionaries in automotive and engineering circles, will be cheaper to operate than today's gasoline-powered automobiles. What's more, it will be practically trouble-free, eliminating costly service bills.

Key to the Car

Key to the successful development of this economical electric "dream car" may well be the sintered-plate, nickel-cadmium battery which is already widely used in jet aircraft, missiles, merchant ships and scores of industrial and household applications.

Sonotone Corporation, Elmsford, N.Y., a major manufacturer of sintered-plate, nickel-cadmium batteries, and American Motors Corporation recently announced a joint research program to study the feasibility of developing a modern version of the electric car of yore.

Research is in the early, exploratory stage at this point. But if the engineers come up with the right answers as to vehicle size, cost, etc. indicating the practicality of modern electric cars, Sonotone expects the nickel-cadmium battery to be the heart of the proposed power plant.

The short life of conventional batteries doomed earlier attempts to build a practical, low-cost electric car. The sintered-plate, nickel-cadmium battery does not have this drawback; it can be expected to last the life of the car. At the same time, it can be charged considerably quicker than other batteries. Each cell is made up of plates of carbonyl nickel powder, developed for this purpose by the International Nickel Company, sintered on a foundation of nickel wire mesh. The resulting rugged, but porous, structure reliably retains the active material, giving long life, and provides the large, effective plate area needed to permit high charge and discharge rates.

The biggest hurdle on the road to a feasible, economical electric car is to

find a way to extend the range of the power plant and still keep the vehicle small and light. At the present time, batteries need recharging after less than 100 miles of travel. To overcome this problem, American Motors and Sonotone are exploring the feasibility of employing a generator driven by a small auxiliary gasoline engine to constantly recharge the battery during operation. The one- or two-cylinder engine would use only a small amount of gas to keep the battery on constant charge during operation of the car.

Besides saving on gas and maintenance the electric car visualized by the researchers would be simplicity itself as far as operation is concerned. The speed of the electric motor propelling the car would be controlled by a foot accelerator.

"Big Dish" Has 600-foot Diameter

The "Big Dish" is going to collect a lot of food in the way of knowledge about the origin of the universe, its shape and its size, it was predicted on Oct. 20 in Washington, D.C.

The "Big Dish" is a 600-foot diameter parabolic antenna, similar to the shape of the familiar radar screen. Being constructed in Sugar Hill, West Virginia, it will, on completion in 1962, be the world's largest radio telescope. At the present time, the 250-foot diameter radio telescope at Jodrell Bank, England, is the largest device in use, and it is reported that the Soviet Union may be building a unit about 350 feet in diameter.

A report on the "Big Dish" was given at a convention session of the American Society of Civil Engineers by Captain F. C. Tyrell, of the Civil Engineering Corps, USN, who is the resident officer in charge of construction at the site.

Capt. Tyrell said the project presented a unique engineering challenge.

The first question that had to be resolved was this: Was it possible to design and construct a steerable radio telescope of this unprecedented size and complexity that would have a very accurate antenna surface and could be driven and controlled to precise aiming tolerances?

"It was apparent," he said, "that the structural steel frame would be required

Even operation of the gasoline motor-generator being considered by American Motors and Sonotone would be automatic, requiring no action by the driver. Controls on the car would consist of a steering wheel, the accelerator, the brake and a lever to put the car in reverse.

Nickel oxide is the active material in the positive plate of the nickel-cadmium battery; metallic cadmium in the negative. The electrolyte is a 30-per cent-by-weight solution of potassium hydroxide in distilled water. The battery requires only a few drops of water a year. It can hold its charge and be charged and discharged under the most extreme temperature changes, ranging from desert heat to sub-zero cold. Thus, a car equipped with the battery would start immediately in any kind of weather.

to support an antenna with a diameter greater than the height of the Washington Monument, and a surface area of approximately 7.1 acres."

Once it was determined that the answer to this question was positive, there remained still other problems, Capt. Tyrell noted.

For the benefit of the engineers at the session, he named 14 different items a "partial" list of the technical problems that must still be solved and the research and development programs generated in meeting the challenge of the "Big Dish."

"The target date for completion of the 'Big Dish' and its supporting facilities is 1962," Capt. Tyrell stated. "If the challenge of design, fabrication and erection are met by the men assigned to the many phases of the project, then the Navy will have available the world's largest radio telescope for research in communications and navigation.

"The radio astronomers also predict that this equipment, with a range of 38 million light-years, or 19 times that of the 200-inch optical telescope at Mount Palomar, California, will assist in answering questions concerning the origin of the universe, its shape and size."

Christmas Advice

While you look at what is given, look also at the giver. —Seneca

"Minuteman" Operational in 1963

Minuteman, highly sophisticated second generation Air Force ICBM, is slated to be operational by early 1963.

Introduced to the public as a defense program in March 1958, Minuteman will provide push-button retaliation against fixed targets—nearing the place where manned planes will be obsolete.

The new ICBM packs a thermonuclear warhead smaller than the Atlas but large enough to blast major targets.

Powered by a new solid fuel which makes it faster and easier to launch, Minuteman is less expensive to operate than its predecessors, is highly mobile and easily handled.

The new missile is capable of operating in three stages. One, two, or all stages are automatically selected for firing according to the distance of the

target. The 57-foot-long missile weighs 65,000 pounds and is capable of ranging from 500 to 5,500 miles.

Present plan is to establish underground 50-missile launching sites in the large flat expanses of the southwestern U.S. Individual missiles will be launched from 80-foot-deep, concrete lined, steel-capped silos. Each missile site will be as bomb-proof as possible and dispersed far enough from its neighbor so that an enemy hit would destroy but one of the installations.

Versatility of the new missile is so great that present planning may include mobile Minuteman trains or truck convoys which would mount the missile on rails or wheels and camouflaged as ordinary freight trains or truck convoys.

In time of emergency, the missile trains would move to predetermined lo-

cations and nuclear-tipped missiles would be launched in moments.

The new high-priority Minuteman was developed under the direction of Lt. Gen. Benjamin A. Schriever, U.S. Air Force Commander of Research & Development, and is to be assembled and tested by Boeing Aircraft Company under U.S. Air Force contract. Guidance systems will be built by North American Aviation's Autonetics Division. Rocket engine propulsion is being developed by Thiokol Chemical Corporation and Aerojet General Company.

Exact details and specifications of the new missile are still classified.

Snow Melter

A new oil-burning snow melter is said to be capable of melting a two-inch blanket of snow from a 30,000-foot lot in less than an hour, states *Product Engineering*.

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Freshman Engineering Enrollments Dip

A decline of 11 per cent in freshman engineering enrollments in the nation last year is cause for serious concern, President John T. Rettaliata said Oct. 18 at the annual meeting of the board of trustees of Illinois Institute of Technology. Dr. Rettaliata is also president of the Western Society of Engineers.

He reported that total engineering enrollments in the nation in the fall of 1958 decreased 2.4 per cent over the preceding year.

In his report to the board at the Chicago Club, he described this decline as "a serious setback in the field of education that is of supreme importance in a time of revolutionary technological change." He noted, however, that upward trends in graduate study in engineering were maintained in 1957 and 1958.

Cites Poll

Citing a recent poll of deans of engineering, Rettaliata attributed the drop in freshman engineering to three factors:

- Mistaken appraisal of the long-range opportunities in engineering by counselors, students, and parents.

- Increased concern about the rigors of engineering education.

- Increased interest in other scientific fields as the result of publicity given developments in atomic and space research.

"The need for engineers is increasing at a greater rate than population gains," he declared, adding that "a strong, long-term need for engineers is clearly indicated." He called for a maximum effort on the part of industry, government, education and all organizations to spur the interest of qualified youth, girls as well as boys, in careers in engineering.

Summing up the status of the engineer, he said, "It seems apparent that there continues to be a lack of public understanding of the proper place of engineering in the 'Age of Science'." To remedy this situation, he advocated "more effective communication with the public so that the engineering profession can receive adequate credit for its accomplishments and achieve its proper stature among the professions."

Speaking of the expanded exploration of space, Rettaliata said that a new age of experimentation is imminent.

"We are faced with the realistic possibility that other planets may be ready for our inspection and visitation. Columbus of our time will be the first person to orbit the earth, probably within the next year," he said.

He warned, however, that "great accomplishments in space cannot occur without education, principally scientific and engineering education."

He said the nation has two distinct obligations: To strengthen education to bring about significant, scientific achievements, and to make every effort to prevent global catastrophe through destructive use of these new discoveries.

Rettaliata reported that Illinois Tech assets on August 31, the end of the fiscal year, amount to \$45,000,000, an increase of \$5,000,000 during the last year. The year-end total investment in land, buildings, and equipment was in excess of \$32,500,000, compared with \$30,487,657 in 1958.

Consolidate annual operating income totaled \$22,125,000, compared with \$21,252,762 last year. During the year more than \$12,500,000 of projects were under construction, on the drawing boards, or committed. A new \$1,200,000 dormitory and dining facilities were completed and opened in September.

Bolts Replace Rivets in Bridges

High strength bolts have almost completely replaced rivets in building and bridge construction in the field, a conference of standardization experts heard Oct. 20 in Detroit.

The ready acceptance of this construction technique in the eight years since it was introduced was attributed to the confidence placed by architects, engineers, and building code officials in the organizations that drew up the standards and specifications for this type of construction.

View of E. R. Estes, Jr.

This view was expressed by Edward R. Estes, Jr., of the American Institute of Steel Construction, at the Tenth National Conference on Standards, sponsored by the American Standards Association. The three-day conference was held at the Sheraton-Cadillac Hotel.

In 1951, the Research Council on Riveted and Bolted Structural Joints issued its specification for high strength steel bolts, Mr. Estes pointed out. The specifications have been endorsed by the American Institute of Steel Construction and the Industrial Fasteners Institute. Materials conform to specifications of the American Society for Testing Materials, and dimensions conform to the American Standard requirements, he said.

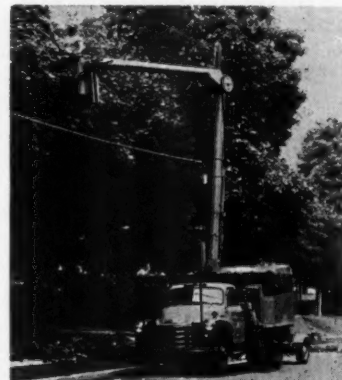
For the future, Estes predicted that working strength of high strength bolts will be increased. "Other research has shown it may be possible to eliminate the washer in high strength bolt assemblies," he added. "It may be that in another eight years the rivet will be as much a rarity in the shop as it is today in the field."

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C-7776 (A) PRODUCT ENGRS. BSME Create-design new products or improve existing products utilizing a staff of process engrs., draftsmen & technicians. Direct fabrication & test evaluation of bread board & prototype models, relative to operation, structural strength, endurance, styling & compliance with specs. Provide tech. assistance. Assist in market analysis to define products, operational specs., growth potential sales & price. Recognize & relate assoc. considerations of finance, investment, production facilities, corporate tech. competence to sales, mfg. & engrg. mfr. of hydraulic pumps, valves & cylinder, sal. \$9/13,000 dep. on exper. loc. So. Wis.

C-7776 (B) INDUSTRIAL ENGR. Grad. Engr. knowl. of related factors of finance, investment, inventory, shipping, receiving, etc. to mfg. Familiarity with mfg. techs. & processes for production lots varying from small to large quantities involving machines ranging from turret lathes to automatic checkers &

screw machines. Perform or direct process engrs. in forward model cost estimating & consulting product engrs. relative to design compatibility with mfg. volumes. Foundry practice knowl. in the grey & malleable irons & sand & perm. mold alum. Suggest & implement process improvements & innovations to effect cost reductions and/or product improvements. Perform plant layouts & control necessary documentation to manage the production facility, bills of materials, routings, standards, etc. Provide vendor consulting & guidance on subcontracting work. Serve in an advisory capacity with mfg. implications in mgmt. decisions, sal. \$9/13,000 dep. on exper. loc. So. Wis.

C-7778 SOILS ENGR. MS in Soils 4+ yrs. exper. in soils work. Prefer one with a Professional Engrs. License. Gov't contract on heavy construction work hdqr. Chgo. with short interval trips to neighboring states. Must be U.S. citizen & able to obtain security clearance. sal. \$8400.

C-7772 TEST ENGRS. Grad. EE power option 1-5 yrs. exper. in elect. lab. Sound knowl. of electric circuits. Duties: Elect. test work on power distribution eqpt. lab. work & power or impulse testing for a mfr. of high voltage elect. apparatus sal. \$6/8400 dep. on exper. loc. S.W.Suburb of Chgo. employer will pay the fee.

C-7779 CHEMICAL UNIT SUPV. Grad. Chem.Engr. age to 30; Duties: Chief Asst. to unit supervisor exper. similar to refinery operations desirable. Must be U.S. citizen, sal. \$8/11,000 loc. Chgo. employer will pay the fee.

C-7796 DESIGN & DEVEL. ENGRS. Grad. ME or EE O-to considerable exper. (indust.) Duties: Design & devel. engrg. on electronic & pneumatic instruments & controls. Must be U.S. citizen. Can use recent grads. & train sal. open dep. on exper. loc. Chgo., employer will pay the fee.

C-7797 PRODUCT APPLICATION ENGR. Grad.Mech. age 30-40; 5+ yrs.

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1014-MW: RESEARCH & DEVELOPMENT BSME 32; Headed product devel. dept. for large valve mfr. exper. in hydraulics, heat transfer, acoustics, mechanics. Knowl. of metal working, plastics & ceramics industries. Demonstrated ability in new product devel. Chgo. Area.

1011-MW: STRUCTURAL OR PROJECT ENGR. BSCE 32; 10 yrs. structural & civil engrg. exper. incl. design of timber, steel, concrete & Alum. structures & bldgs. Follow project to completion in field, supv. draftsmen, registered struct. & p.e. in Ill. South, W., or M-W.
1005-MW: PLANT SUPT. BS Met.Eng. 37; 3 yrs. melting & fabricating alumin. 10 yrs. open hearth & elect. basic steel making both in mills & foundry. Exper. in casting & forging of ingots up to 30 ton. Also research & complaint investigations.

exper. in application & sales engrg. Duties: Working in sales dept. developing application of carbon dioxide & dry ice. Write material for sales dept., research of new application of product. Newly created position. At present will supv. one metallurgical engr. dept. ultimately will be 3 grad. engrg. & staff of 5 or 6 field men. Must be U.S. Citizen sal. \$12,000 loc. Chgo.

C-7798 INSIDE SALES TRAINEE Grad.ME or Chem.E. age to 30; 0-5 yrs. exper. in sales or engrg. Duties: Sales trainee—handling tech. correspondence, prepare sales bulletins, etc. on heat exchangers. After training in office for abt. 2 years will be assigned to field sales engrg. contacting OEM accounts. Must have good sales personality sal. \$6600/8400 dep. on exper. loc. So.Wis. employer will negotiate the fee.
C-7733 (A) ENGINEER BS or MSME age 25-32; 3 yrs. exper. in design & devel. of eqpt., know mech. engrg. Duties: Research, design, devel. & evaluation of eqpt. for the mfr. of metal, plastic & fibre containers sal. \$6/750 mo. loc. No. Shore Chgo. Suburb, employer will negotiate the fee.

Sulfuric Acid Plant

Leonard Construction Company of Chicago has announced the completion and start-up of a 400-ton daily capacity sulfuric acid plant for the J. R. Simplot Co. at Pocatello, Idaho.

The new plant, which was designed, engineered and constructed by Leonard, uses recovered sulfur from local refineries, and Monsanto Chemical Company vanadium sulfuric acid catalyst. The sulfuric acid is used for increased production of wet process phosphoric acid which in turn is used by Simplot for the manufacture of phosphate fertilizers. Construction was started in December, 1958.

That's Semantics

The average worker may get fired if he knocks off work to go fishing, but when roughnecks drilling an oil well do it, their boss joins in, according to *Petroleum Week*. "Fishing" in the oil industry is the difficult, time-consuming process of recovering a drill bit that has broken off at the bottom of a hole. The job is often done with tapered taps, mechanical claws or magnets.

Chicagoan Wins Welding Award

Fourth major award of \$2,500 has been made to John K. Liu, associate director of Research and Development, Clearing Division, United States Industries, Inc., Chicago, in the 1959 Machine Design Award Program of The James F. Lincoln Arc Welding Foundation, Cleveland. His residence is at 2933 Sheridan Road, Chicago.

Liu's contribution covered the unique concept of an arc welded steel engine lathe which is three times as rigid as the old type cast iron unit, and can be built at a cost saving of 12 to 15 per cent.

The entire design is radically new and suggests a powerful weapon against

the inroads of foreign competition in the machine tool field.

Some 72 engineers throughout the country shared in the \$50,000 awards. All advanced specific ideas for the advancement of arc welding in the construction of a wide range of machinery.

Top award of \$10,000 went to Ernst Duesing, supervisor for Oliver Machinery Co., Grand Rapids, Michigan, for detailing the redesign of a wood turning and metal spinning lathe. With arc welded steel components, a price reduction of 35 per cent over former cast iron models was made possible.

Some 50 other awards ranged from \$7,500 down to \$250 each.

Semiconductor Plant Completed

Plant facilities for the recently-incorporated National Semiconductor Corporation will be located in Danbury, Conn., Dr. Bernard J. Rothlein, president, has announced.

The plant, a modern, one-story 10,500-square-foot building, is located at 4 Thorpe Street. Installation of air-conditioned dust control and latest manufacturing equipment for production of the company's semiconductor devices is underway and was completed in September.

The young corporation was organized in June by Dr. Rothlein and seven other scientists from Sperry's Semiconductor Division. Dr. Rothlein was formerly technical director of that division.

Since that time Dr. Edward N. Clarke, former Sperry Semiconductor research head, was named vice president for

operations of the new company, and Donovan H. Tyson, formerly vice president and treasurer of Allen B. Dumont Laboratories, Inc., became treasurer.

Others included in the formation of the company are Joseph J. Gruber, Dr. Milton Schneider, Arthur Siefert, Robert L. Hopkins, Robert Koch and Dr. Richard R. Rau.

Backward Turn

A watch that had to be wound 158 half turns in order to run for 30 hours was one of the most popular timepieces in America in the 1880's, states *American Machinist*. It cost only four dollars and was composed of 59 parts including a nine-foot spring.

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Science Tests Weight On Your Feet

How great is the load on your feet? Science for the first time is trying to measure this load in research conducted at Case Institute of Technology. The research team is headed by Dr. John Scalzi, Associate Professor of Civil Engineering, and includes Instructor Don Sherman. The medical advisor to the project is Dr. J. W. Blunt, Acting Director of Surgical Research at St. Luke's Hospital in Cleveland.

The answers they find will be important to surgeons in demonstrating how much of a load is placed upon broken bones in the leg. Their findings will also be used by the designers of the mechanical bone and joint replacements which are increasingly utilized in recent years and will allow these designers to make better calculations of the factors of safety involved.

Measurements of the load on the feet are also important to the men who design and manufacture shoes and to the millions of people who wear them.

In the experiments not only the vertical load on the foot as an individual walks will be measured, but also the twisting forces, sideways and forwards, that are involved in each step will be calculated. Such factors as high-heeled shoes and running and jumping will also be studied, as well as the way a person's gait changes as he grows older.

In the current research program the scientists plan to begin by studying the load on the foot itself. They will attempt to find a ratio between how much a person weighs and the maximum force which is placed upon his feet while he walks. Secondly, they will find out whether people put more weight on their right or their left foot.

The data collected will be correlated with age, weight, right or left handedness, leg length and type of gait. Motion pictures will be taken for detailed studies on the process of walking in order to correlate with the forces found to exist at specific points in walking.

Once the load on the foot has been determined the study will be extended to other parts of the leg including the ankle, knee, and hip. Here too, the forces involved are of particular interest to orthopedic surgery.

Tiny flat coils of wire $\frac{1}{8}$ inch long called strain gauges are the key instru-

ments in measuring the loads. The electrical resistance of a strain gauge varies with the mechanical load that is placed upon it. This variation is automatically recorded and is sensitive enough to record the force of as little as one pound.

Strain gauges are located on four

vertical metal rings placed at angles beneath a live panel in a runway across which an individual walks. Circuits on the strain gauges are so arranged that pairs of them respond to the three varying directions of the forces placed upon them.

ISA Is Awarded NSF Grant

The Instrument Society of America has been awarded a grant by the National Science Foundation to continue the translation and publication of the 1959 issues of English editions of four leading Russian technical journals.

Undertaken as a service to American science and industry the ISA "Soviet Instrumentation and Control Translation Series" now in its third year affords an excellent means for U. S. scientists and engineers to become better informed of the latest developments in the field of Soviet instrumentation. It also corrects a situation whereby Russians for many years have been translating scientific English literature while the United States

has received much of its knowledge of Soviet activities by word of mouth or through more startling channels such as the launching of satellites.

Impractical?

West Germany's drivers do not take a backseat to anybody, not even highway designers, reports *Engineering News-Record*. Some designers working in the country's road building program would like to plan six- or even eight-lane superhighways, instead of four-lane divided roads. The designers' plans are termed impractical, since German drivers object to passing on both sides.



In accordance with Article 1, Section 5 of the By-Laws of the Western Society of Engineers, there is published below a list of applicants for admission received since the last issue of the MIDWEST ENGINEER magazine.

Thomas J. Terrell, Sr., Chief of School Constr'n., Chicago Board of Education, 228 N. LaSalle St.

James E. Chartier, Assist. Plant Engr.,

Illinois Bell Telephone Co., 116 S. 5th Ave., Maywood, Ill.

Floyd E. Bevell, Job Supt., Lake States Engineering Corp., 53 W. Jackson.

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Scientific Editing Task Completed

John H. Martens, a staff member of the Argonne National Laboratory, Lemont, Ill., has returned to the Laboratory after completing the task of editing one of the world's largest scientific compendia, the 33 volume *Proceedings of the Second International Conference on the Peaceful Uses of Atomic Energy*.

Martens, who is associated with the Laboratory's Technical Information Division, was chief editor of the *Proceedings*, directing a team of from 5 to 24 scientific editors from six countries. He left the Laboratory in April, 1958, to begin work on the project; he returned this August.

Three other Argonne staff members assisted Martens in editing the *Proceedings* at Geneva and at United Nations headquarters in New York. Dr. John H. Pomeroy, of the Laboratory's Biology Division, a delegate to the Geneva Conference scientific exhibit program, worked two months in Switzerland with Martens during initial stages of editing. Dr. Kundan S. Singwi, a conference delegate from India who is now with the Argonne Solid State Science Division, also aided in the initial editing.

Dr. Alvin Glassner, of the Technical Information Division spent two and one-half months in New York this spring helping put the English edition of the *Proceedings* into final form.

In their complete English language edition the *Proceedings* contain some 19,000 printed pages and 15,000 illustrations. There are 2,135 conference papers contributed by scientists and engineers in 46 countries.

The papers summarize in detail world-wide progress in peaceful applications of atomic energy since a 1955 Geneva Conference was held on the same subject. The newly published set of *Proceedings* is about twice the size of the set of *Proceedings* of the 1955 meeting.

Bulbs Burn Brighter

Incandescent light bulbs can burn brighter if some iodine is put into them, reports *Electrical World*. Two lighting engineers, developers of an experimental iodine-treated bulb, maintain the iodine prevents the glass sides of the lamp from darkening after burning for some time.

Africa Offers Pollucite Supply

An extensive deposit of high grade pollucite ore has been developed at the Southern Rhodesia, Africa, operations of Bikita Minerals (Private) Ltd., according to an announcement by American Potash & Chemical Corporation, which handles the sale of Bikita products.

Tests indicate the deposit is one of the largest in the world and offers a reliable supply of low-cost pollucite, which is aluminum-cesium silicate, for cesium applications in such industries as glass and ceramics manufacturing, in welding rod fluxes and other uses where silica can be utilized along with the cesium.

Pollucite in the Bikita deposit averages 24.4 per cent cesium oxide.

Cesium in the past has been available only in small quantities until American Potash recently began sales of cesium

metal and cesium compounds produced from lepidolite lithium ore at San Antonio, Texas.

Bikita's pollucite reserves are part of its large lithium-beryllium deposit located near Fort Victoria, Southern Rhodesia. Bikita Minerals is owned principally by Selection Trust Limited, which acts as manager of the company, American Potash & Chemical Corporation and American Metals Climax, Inc.

A dramatic potential use for cesium is in ion-propulsion engines for space travel. Under development at present, this type of engine produces small thrust but becomes practical in outer space after a vehicle's initial speed has been provided by rockets or other power source. The ion-propulsion engine then will operate at vast inter-planetary range.

Calendar of Engineering Events

Dec. 16, Wednesday, WSE Noon Luncheon Meeting, 12:00 noon. "The Inside Story of the Museum." Speaker, Clifford C. Gregg, director of the Chicago Natural History Museum. At WSE Headquarters.

Dec. 17, Thursday, WSE 90th Anniversary Ladies Night Christmas Party. See back cover for full details.

Dec. 28-29, Monday-Tuesday, American Association for the Advancement of Science, Section M, Engineering. See page 21, November, 1959 *Midwest Engineer* magazine for details.

Jan. 6, Wednesday, WSE Noon Luncheon Meeting, 12:00 noon. "The Narcotics Menace." Speaker, Sigmund Stefanowicz, judge of the Municipal

Court, City of Chicago. At WSE Headquarters.

Jan. 13, Wednesday, WSE Noon Luncheon Meeting, 12:00 noon. At WSE Headquarters.

Old and New

Nuclear energy is being used to test the soundness of wooden railroad ties, reveals *Engineering News-Record*. The density tester uses low-level gamma rays which are reflected from the interior of the tested material, back to a radiation counting device. A sound tie reflects more ray. The tester also might be used in determining soundness of piles, floors, beams and other timber structures.

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Drydock For West Coast Facilities

The Navy's largest drydock, under construction at Puget Sound, will provide West Coast facilities to service the largest fleet units that are in service or under construction, and also those on the drawing boards or contemplated, it was revealed Oct. 20 in Washington, D.C.

Details on the construction of the drydock, called the Carrier Repair Site, were reported to the convention of the American Society of Civil Engineers in a paper authored by Captain S. P. Zola, officer in charge of construction and Captain P. M. Boothe, resident officer in charge of construction. Both are in the Civil Engineering Corps of the U.S. Navy.

The drydock structure, to be completed in 1961, will be 1,180 feet long, from the head end to the outboard face, 180 feet wide at the coping and 61 feet deep.

The engineers said the development of the *Forrestal*-class of carrier brought about the construction of the Puget Sound structure, located at the Naval Shipyard, Bremerton, Wash.

Completion of the Panama Canal in 1914 provided the U.S. Fleet with the capability to maneuver between the Atlantic and Pacific Oceans with a minimum loss of time, and thus established the two-ocean concept. Subsequent ship design had been controlled by the limitation of the 110-foot wide canal locks until the development of the carrier *Forrestal*.

"A major casualty to one of these vessels in the North Pacific could now entail a cruise more than halfway around the world due to lack of adequate drydocking facilities on the west coast," the engineers noted in the paper.

World War II carriers were not substantially larger than battleships, the engineers said, and presented no particular problems in connection with drydocking. However, with the advent of the *Forrestal* and subsequent supercarriers, one of them the *Enterprise*, nuclear powered, a shortage of adequately sized drydocks for carrier repair became apparent.

Although the hull of the new carriers will fit into the largest existing drydocks, the capability of effective maintenance and repair below the water line is seriously impeded by the lack of adequate

working clearances between the ship and drydock walls. Also, portal crane service is hampered by the wide overhang of the angled flight deck, preventing passage of the cranes.

Some idea of the immensity of the Navy's largest drydock can be gained by the dimensions of the floating cassion-type gate which serves as the closure at the drydock entrance. It is a watertight,

all welded steel, boxlike structure approximately 176 feet long by 20 feet wide and 63 feet high.

Despite its enormity, only a 90-minute period will be required to fill, or flood, the dock with approximately 88 million gallons of water. This is an average flow of almost 1 million gallons per minute. Dewatering the dock will require 226 minutes, or less than four hours.

Computer Age Poses Problems

The computer age poses several problems in communications, among them accuracy of transmission by teletypewriter. In previous years teletype users got along without automatic means for detecting errors as mostly ordinary English text was transmitted and its redundancy was so large that there was little difficulty in reconstructing misspelled words.

Now much telegraph material is "data" consisting of numeric material in which error is not easy to find.

"This," the Fall General Meeting of the American Institute of Electrical Engineers was told in Chicago on Oct. 13, "has brought about an increasing demand for an automatic means of detecting when and where transmission errors have occurred so that their possible bad effects may be guarded against."

Such a means for accomplishing this was described by P. H. Barry, Teletype Corp., Chicago, and A. L. Whitman, Bell Telephone Laboratories, Inc., New York, in a paper, "An Error-Detection System for 5-Unit Code Teletypewriter Transmission," presented at a symposium on data communications.

"The error detecting method is based on the addition, at the originating end of the circuit, of a redundant character, known as the check character, after each checking block of text, the checking block being a typed line (about 72 characters) or portion of a line terminated by a carriage-return (CR) signal. . . . When the CR signal in the sending-station tape is sensed by the transmitter, the transmitter stops and waits while a sequence of five error-detection control characters, including the check character, are sent on the line from the error-detecting circuit. The transmitter then resumes sending from

the tape, the next character being the line-feed (LF) character necessary to advance the teletypewriter paper. The check character is a character unique to its checking block . . .

"At the receiving end a new check character is locally generated from the received text by the same process as that used at the sending end. The locally generated check character is compared with the character sent over the line. If the two do not agree, it is an indication that an error has occurred in the preceding line of text. An alarm is sounded, a lamp lights, and an identifying mark is made on the copy of the line in error . . ."

The authors warned, however, that the system can detect only one error per line and that it is useful only in detecting errors that occur in transmission, not in the original teletyped or taped message.

They said that the reduction in undetected errors by their method, "is expected to lead to significant improvement in the quality of teletypewriter transmission."

Time Saver

An aircraft company, by installing a digital computer, has cut manual testing time on missile parts from four hours to three-to-five minutes, reports *Control Engineering*.

Hot Water Heaters

Solar energy will heat water for the 6,500 students at Al-Azhar Theological University in Cairo, reports *Engineering News-Record*. The solar heaters will cost only a quarter of the price of butane heaters, standard in Egypt.

Engineers Build to High Tolerances

Engineers today are being called upon to design and build to tolerances that a short time ago were considered achievable only in a laboratory, a speaker told the American Society of Civil Engineers at a convention session in Washington, D.C., on Oct. 20.

Commodore A. D. Hunter, USN (Ret.), of Washington, D.C., said a case in point was the construction of the test underwater launcher for the Navy's Polaris missile, which is designed for firing from nuclear submarines.

The test underwater launcher was constructed on the ocean floor near San Clemente Island, about 60 miles off the coast of Southern California.

Construction took an amazingly short time of only three months, the project being completed in January of 1958. Culmination of what Commodore Hunter called "the grand effort," but known as the "Pop-Up" project, was the first test firing of the Polaris prototype missile in March 1958 from the test launcher near San Clemente.

The speaker detailed the many problems confronting the engineers in constructing the prototype launcher on the ocean floor. These included construction in deep water, working in the open ocean, the ever-present danger of a "Santa Ana condition," which is a fierce type of storm characteristic of the area, and the logistic problems incident to working at a distance from the main base, which was San Diego. Not the least of the problems was the time factor: starting work in October of 1957 and completing the project by January of 1958.

"This time requirement is typical of facilities that are required in connection with the missile program," Comm. Hunter said.

"It sometimes seems as if the long-haired planners plan for years, and when they finally bring forth an idea they have to have the necessary facilities by quitting time that night.

"This may be necessary due to the nature of the beast, but it certainly puts a strain on the 'brick and mortar' brigade that has to figure out how to meet the time schedule."

He said that all connected with the project soon were aware that the test launcher was no everyday construction job. Six methods of construction were

proposed, and a pre-fabricated foundation form method was finally selected.

This method involved the shoreside construction of a steel foundation form, a launcher base ring and a base ring leveling frame as separate units. These components then were transported to the

site, lowered into position and embedded into the sand on the ocean bottom.

A suction airlift then was used to complete interior excavation of the caisson, and concrete poured to fill the form and secure the case ring. On completion, the leveling frame was removed.

Better View of Snow and Palms

Passengers on the *City of Miami* whose choice is rail travel because they can enjoy the ever-changing scenery will now have an even better view of northern snows and southern palms. On October 26, dome cars were installed in the streamline Florida train. Emmitt L. Holmes, passenger traffic manager of the Illinois Central Railroad, announced the cars will be operated on the *City of Miami* throughout the fall and winter travel season. This is the first season of dome car service between the Midwest and Florida.

The cars have been leased from the Pullman Company. With the close of the winter travel season, the cars will be returned to the Pullman Company for summer operation by a western railroad. The use of the same equipment by two railroads during their different peak seasons will result in more complete utilization of expensive passenger equipment.

Each car will seat 24 people in the dome observation area. The lower level contains four roomettes, four duplex single rooms and four double bedrooms.

MIDWEST ENGINEER

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Nuclear-Powered Saline Water Project

The Department of the Interior and the Atomic Energy Commission have signed an agreement for a cooperative project for the development of a nuclear-powered saline water conversion plant, Fred A. Seaton, Secretary of Interior, and John S. Graham, Acting Chairman of the Atomic Energy Commission, announced on Oct. 10.

Under the agreement, the Commission would design, construct and operate a 40,000 thermal kilowatt, experimental, low-temperature process heat reactor capable of producing saturated steam at pressures from 5 to 175 pounds per square inch gauge. The Department of Interior would design, construct and operate a saline water conversion plant which would use steam from the reactor to produce at least 1,000,000 gallons of fresh water per day.

Because construction funds have been appropriated for the reactor but not for the conversion facility, the agreement is contingent upon funds being made available to the Department of Interior for its facility.

The reactor would be of the pressurized water type and would be used to determine the economic and technical feasibility of nuclear reactors for producing process heat. It is anticipated that process heat reactors can also be used in manufacturing industries, such as those for the production of primary metals; and petroleum, coal, chemical, food and paper products.

The saline water conversion plant would incorporate advanced concepts of the multi-stage flash distillation proc-

ess designed to demonstrate the economic and technical feasibility of sea water conversion.

To enable the Commission to conduct an experimental program without interfering with the continued operation of the Department's conversion plant, the reactor and the conversion plant would be capable of operating independently of each other. The combined facility would be located at Point Loma, San

Diego, California. Estimated cost of the reactor is \$4,000,000, and estimated cost of the conversion plant is \$2,000,000.

Architect-engineering services for the reactor are being performed by Sargent and Lundy of Chicago. Design services for the conversion plant are being performed by The Fluor Corporation, Whittier, Calif. Construction and pre-operational testing are scheduled for completion in January 1962.

New Means For Spreading Data

Entering upon what it regards as "an exciting new means of widespread distribution of important technical information covering the spectrum of metallurgy," The Metallurgical Society of AIME has announced a series of volumes, to be known as *Metallurgical Society Conferences*, presenting proceedings of technical conferences of the Society or of its technical committees.

The Society is a constituent organization of the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME). Announcement of the new series was made by the society's president, Dr. John Chipman, head of the Department of Metallurgy, Massachusetts Institute of Technology.

The program is in cooperation with Interscience Publishers, Inc., New York City, and affords a coordinated distribution both nationally and internationally. The first volume, now available,

is on "Flat Rolled Products: Rolling and Treatment," consisting of proceedings of a technical conference held in Chicago on January 21, 1959, sponsored by the Mechanical Working Committee of the Society's Iron and Steel Division and the Chicago Section of AIME.

Dr. Chipman stated that the method entered into is intended to provide comparatively rapid publication of scientific and engineering papers in a framework that should prove most useful to the reader. In effect, the "Metallurgical Society Conferences" series will complement *Journal of Metals* and *Transactions of The Metallurgical Society of AIME*. While books will vary in composition, printing methods and binding, the format will be uniform and the aim "is to publish books of high quality at the lowest possible selling price consistent with the probable demand for the books."

Tool Standards Are Still Needed

National tool standards are still needed in many areas, George J. McLaughlin, standards head of the manufacturing engineering division, Grumman Aircraft, said on Oct. 21 in Detroit at the Tenth National Conference on Standards.

He listed several needs: uniformity in descriptions of band-saw blades, tolerances for ream bushings, color codes used with templates in chemical milling, and a uniform three-letter tool code.

The three-day conference on standards, sponsored by the American Standards Association, was held at the Sheraton-Cadillac Hotel.

Engineers can gain professional stature by seeking ways to cut costs, reduce

inventory, and widen product application through standards, McLaughlin said. They can gain recognition as well by taking part in national projects, and particularly by suggesting areas, such as those he listed, where national standards projects are needed.

McLaughlin listed situations to look for that lend themselves to improvement through standardization. He explained how national standards projects usually operate, calling together experienced engineers from many industries.

The rewards for participation in national standards work are professional recognition and the sense of contribution to the advancement of industry and the economy, McLaughlin said.

In Memoriam

The Western Society of Engineers has recently been notified of the following deaths of members:

Horace B. Horton ('13, LM), Sept. 17, 1959

Clifton J. Metzger ('29, M), reported Sept. 29, 1959

Russell A. Thompson ('35, M), Sept. 7, 1959

John F. Brown ('13, LM), Oct. 18, 1959

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1959

Luncheon Meetings Continue Success!

Series II Tickets are now on Sale

Series I is now approaching its end. And it may be said that the dinner meetings of the series, each of them, have been highly successful. They have all been of the type that it is a pleasure to attend—interesting, stimulating, and pleasant—attested to by the fact that attendance each Wednesday approached 100.

Much of the success of Series I is attributable to the Luncheon Booklets of 10 tickets. This guaranteed a good speaker which in turn guaranteed a good audience.

The idea of the Luncheon Booklets is being continued for Series II, and Books of tickets are now on sale. Each Book of 10 tickets sells for only \$15, or \$1.50 per ticket as compared with \$2.00 for individual tickets.

Each Book of tickets will be registered as designated by the purchaser. Each ticket is transferable for the date shown and will guarantee the ticket holder a seat.

In addition to being assured a good seat for the

luncheons, the Book of tickets adds to their value for business entertaining. If the holder can't attend the luncheon, the ticket can be given to some one who can attend.

The luncheon committee hopes to have at least 100 Series II ticket Books out so that every luncheon speaker will be assured, as in Series I, of a capacity audience. With that assurance a program of nationally known speakers on all important phases of engineering programs will be arranged. It is believed that with the support of WSE members and their organizations it will be possible for the WSE luncheons to continue to command the same prestige for engineering as the Executive Club luncheons do for business.

Send in your order today for one or more of the Series II luncheon books.

Series I

Below are listed some of the interesting meetings of the Noon Luncheon Series now in progress:

SEPT. 23, "Electrical Heating in Homes of the 1959 Future"—Robert C. Geyer of Commonwealth Edison Company told of the steps being taken to provide electrical heating within the reach of the homeowner.

SEPT. 30 "Space Programs of the U.S. and the U.S.S.R."—Robert I. Johnson, Acting Director, Adler Planetarium discussed the latest data from man-made satellites and the differences in objectives of space programs between the U.S. and the U.S.S.R.

OCT. 7 "Psychological Warfare Against Recession"—Wesley I. Nunn, Graduate Director, Advertising Council, introduced this film, a dramatization of the importance of public confidence in preventing financial panics.

OCT. 14 "Chicago's Future as a World Seaport"—James J. Pisco, Chief Engineer, Chicago Regional Port District, made a prediction of the effect of the St. Lawrence Seaway on Chicago's shipping industry.

OCT. 21 "Unique Construction Methods on the Union Dome at Wood River, Ill."—Mr. R. C. Ulm, Manager, Product Research, Graver Tank Co., discussed how his company erected a structure with a cushion of air. Jointly sponsored with the Bridge and Structural Section.

OCT. 28 No W.S.E. meeting. American Society of Mechanical Engineers has a luncheon scheduled.

NOV. 4 "Human Engineering"—Mr. S. L. Jewell, Vice-President, Peabody Coal Co., gave some thoughts for engineers to keep in mind when dealing with people.

NOV. 11 "Railroading in the Atomic Age"—Douglas Campbell, Vice-President, New York Central R.R., Chicago, tells what the railroads are doing to meet the coming demands for speed, safety and economy in transportation. Jointly sponsored with the Transportation Section.

Series II

At a recent meeting, the Noon Luncheon Committee organized a tentative list of interesting speakers. The committee is asking these highly desirable speakers to appear before a Wednesday Luncheon Meeting. Some have already accepted, and you may rest assured that most of the others will also accept, particularly after the enthusiastic reception given to the Series I speakers.

The Luncheon Committee's list includes the following speakers:

—Clifford C. Gregg, director of the Chicago Natural History Museum

—Judge Sigmund Stefanowicz, of the Municipal Court of Chicago

—Robert Babenek, a scientist with the American Machine & Foundry Co.

—Gaylord Donnelley, president of R. R. Donnelley & Co.

Dec.	16, 1959	WSE	Feb.	10,	WSE
				17,	WSE
Jan.	6, 1960	WSE		24,	*ASME
	13,	WSE	March	2,	WSE
	20,	WSE		9,	WSE
	27,	*ASME		16,	WSE
Feb.	3,	WSE		23,	*ASME

*The Chicago Section of the American Society of Mechanical Engineers has scheduled luncheons at WSE during the season. Contact Chicago section for tickets.

Luncheon Committee, Western Society of Engineers 84 East Randolph Street, Chicago 1

Yes, I would like to support your committee in your plan to assure attendance at WSE luncheons. Here is my check for \$_____ to cover _____ Series II books at \$15.00 each. It is my understanding that each ticket is transferable for the date shown and may be given to a WSE member or to a non-member.

Name _____

Business _____

Organization _____

Mail ticket to me _____

at this address _____

Register Book(s) _____

for name(s) shown _____

★ December 17

The Western Society's

90th Anniversary

Ladies Night

Christmas Party

The Final and
Greatest Event of the
90th Anniversary Year

Don't Miss:

- Complimentary Social Hour

At 5:30 p.m., on the 6th floor lounge, in the spirit of ye olden days. Libations of long ago—Strolling minstrels—Palate teaser tidbits of the New England Christmas Season.

- Pioneer Dinner

At 6:30 p.m., in the 5th floor dining room, carried out in the style of 90 years ago, with suckling pigs and turkeys as the show pieces. You will see them carved before your eyes; and the platters and all the supporting dishes will be served family style, just as was done in 1869. And all tables seat 20, so you and your group will meet some new faces among WSE members and guests.

- Featured Speaker

H. I. Romnes, president of Western Electric Company, will receive an Award Citation from WSE. Mr. Romnes will then present the featured speech of the evening, entitled "Individualism in Engineering."



- Vocalizing Through the Years

At 8:30 p.m., in the 7th floor auditorium, continuing the evening's theme. If you like the singing of barber-shop quartets, and who among us doesn't, you will be pleasantly and amusingly entertained by a live Musical Show. The Show starts with music popular in 1869, and brings you right up to date.

Western Society of Engineers
84 East Randolph St., Chicago 1

Please reserve _____ places for me at \$6.00 each—which covers everything: free social hour, dinner, program, and musical show—at the Western Society's 90th Anniversary Ladies Night Christmas Party, Dec. 17, 1959. My check is enclosed.

Name _____

Address _____

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